TABLE OF CONTENTS

Chapter Page

TABLES

Page

FIGURES

Page

CHAPTER 4
ENVIRONMENTAL IMPACTS

4.1 INTRODUCTION

This chapter presents the reasonably foreseeable direct and indirect environmental impacts that could occur from implementing the proposed action or the alternatives presented in **Chapter 2**. This chapter is organized by topic, similar to **Chapter 3**, Affected Environment. Each topic area includes a method of analysis section that identifies indicators, methods, and assumptions and an analysis of impacts for each of the alternatives. Where applicable, the resource section also outlines mitigation measures and assesses residual impacts. An analysis of potential cumulative impacts is presented in **Chapter 5**.

This impact analysis identifies impacts that may result in some level of change to the resource, regardless of whether that change is beneficial or adverse. The impact analysis does not include a subjective qualifier (beneficial or adverse) to the impact; instead, it states the nature, magnitude, and context for the change (see **Section 4.1.1**, General Method for Analyzing Impacts, for more detail).

The evaluations presented in this section are confined to the actions that have more prominent, immediate, or direct effects. Some of the proposed activities may affect only certain resources and alternatives. If an activity or action is not addressed in a given section, no impacts are expected or the impact is expected to be negligible.

Impact analysis is a cause-and-effect inquiry. The detailed impact analyses and conclusions are based on the interdisciplinary team's knowledge of resources and the project area, reviews of existing literature, and information provided by experts at the BLM and other agencies. The baseline used for the impact analysis is the current condition or situation, as described in **Chapter 3**, Affected Environment. Impacts on resources and resource uses are analyzed and discussed in detail, commensurate with resources issues and concerns identified

throughout the process. At times, potential impacts are described using ranges or in qualitative terms.

4.1.1 General Method for Analyzing Impacts

Potential impacts or effects are described in terms of type, context, duration, and intensity, which are generally defined as follows:

- Type of impact—Because types of impacts can be interpreted differently by different people, this chapter does not differentiate between beneficial and adverse impacts, except in cases where such characterization is required by law, regulation, or policy.
- Context—Context describes the area or site-specific, local, project area-wide, or regional location in which the impact would occur. Site-specific impacts would occur at the location of the action, local impacts would occur in the general vicinity of the project area, and regional impacts would extend beyond the project area and local area boundaries.
- Duration—Duration describes the length of time an effect would occur, either short term or long term. Short term is defined as anticipated to begin and end within the first five years after the action is implemented; long term is defined as lasting beyond five years to the end of or beyond a 50-year project horizon.
- Intensity—This analysis discusses impacts using quantitative data wherever possible; if that is not possible, qualitative statements are used.
- Direct and Indirect Impacts—Direct impacts are caused by an action or implementation of an alternative and occur at the same time and place. Indirect impacts result from implementing an action or alternative but usually occur later in time or are removed in distance and are reasonably certain to occur.
- Cumulative Impacts—Cumulative impacts are the direct and indirect effects of a proposed project alternative's incremental impacts, when they are added to other past, present, and reasonably foreseeable actions, regardless of who carries out the action (40 CFR, Part 1508.7). Cumulative impacts are discussed in **Chapter 5**.

Analysis shown under an alternative may be referenced in the other alternatives with such statements as "impacts would be the same as, or similar to, the proposed action" or "impacts would be the same as the proposed action, except for…" as applicable.

4.1.2 Assumptions

Several assumptions were made to facilitate the analysis of the projected impacts. The following general assumptions apply to all resource categories. Any

specific resource assumptions are provided in the methods of analysis section for that resource.

- Implementing actions specified in the alternatives would be in compliance with all valid existing rights, federal regulations, BLM policies, and other requirements.
- The functional capability of all developments would be appropriately maintained.
- The discussion of impacts is based on the best available data. Knowledge of the project area and professional judgment, based on observation and analysis of conditions and responses in similar areas, were used to infer environmental impacts where data were limited.
- Acreages and other numbers used in the analyses are approximate projections and are for comparison and analytic purposes only. Readers should not infer that they reflect exact measurements or precise calculations.

4.1.3 Incomplete or Unavailable Information

The CEQ established implementing regulations for NEPA, requiring that a federal agency identify relevant information that may be incomplete or unavailable for an evaluation of reasonably foreseeable significant adverse effects in an EIS (40 CFR, Part 1502.22). If the information is essential to a reasoned choice among alternatives, it must be included or addressed in an EIS.

The best available information pertinent to the decisions to be made has been used in developing this EIS. Considerable effort has been taken to acquire and convert resource data into digital format.

4.1.4 Elimination of Irrelevant Issues

Certain elements are not discussed or analyzed further in this EIS. These are listed under the supplemental authorities or additional affected resources that do not occur in the project area and would not be impacted by the proposed action or alternatives. Those elements eliminated from consideration in this EIS are discussed in **Chapter 3**, Affected Environment, **Section 3.1**, Introduction. The elimination of irrelevant issues follows CEQ regulations in 40 CFR, Part 1500.

Although discussed in **Chapter 3**, Affected Environment, it was determined that Native American Religious Concerns, Geology and Minerals, and Lands and Realty would not be affected by the proposed action or alternatives and are not analyzed further.

In addition, it was determined that the following elements, or resources, would only be indirectly effected by the extended time for activities under the

proposed action (5 to 7 years). There would be no new direct impacts associated with the proposed action or alternatives; therefore, these elements are not analyzed further.

- Wastes and Materials (Hazardous and Solid)
- Transportation, Access and Public Safety

4.2 AIR QUALITY

The federal Clean Air Act (CAA) is the primary controlling legislation over air quality. Ambient air quality and the emission of air pollutants are regulated under both federal and state laws and regulations. The federal and state ambient air quality standards are the minimum standards of quality for ambient air. Regulations potentially applicable to the proposed action and alternatives are the following:

- NAAQS
- Nevada state ambient air quality standards
- Attainment and nonattainment areas
- Prevention of Significant Deterioration
- New Source Performance Standards
- National Emission Standard for Hazardous Air Pollutants
- Federal Operating Permit Program (Title V)
- State of Nevada air quality regulations and standards for permits to operate under NAC 445B

The proposed action and action alternatives would increase the atmospheric emissions of pollutants regulated by the above-listed laws and regulations. The purpose of this resource section is to describe and disclose the potential impacts on air quality from the proposed action and alternatives.

4.2.1 Analysis Method

Construction and operational activities associated with POA 10, including expanded light and heavy duty vehicle and haul truck traffic, would increase air emissions in the project area. The BLM requested that an air impact analysis be submitted as part of the EIS to demonstrate compliance with the NAAQS. Stantec (2015) prepared an assessment of air pollutant emissions from the proposed action and compared these emissions to the impact indicators. The baseline or No Action Alternative emissions are outlined in **Table 3-6**, Coeur Rochester Mine Emissions, in **Chapter 3**.

The air quality impact analysis for the proposed action included both atmospheric dispersion modeling and quantification of project emissions from mining and processing ore from the proposed project. Air quality modeling was

performed to identify, to the extent feasible, what impact project emissions would have on ambient air quality. While the development plan detailed in POA 10 includes both the expansion of the existing mine and its eventual closure, modeling was completed only for the expansion and operational stages of the POA, as these periods would produce the greatest potential for ambient air quality impacts. However, emissions estimates for all stages of POA 10 were developed, and the air quality analysis in this EIS evaluates all activities associated with POA 10.

The air dispersion modeling was developed following recommendations of the BLM and cooperating agencies and taking into consideration the precedents set forth in the NDEP guidance document General Air Dispersion Modeling Guidelines (NDEP, BAPC Guidance, September 2013) and the EPA's Guideline on Air Quality Models (Guidelines, 40 CFR, Part 51, Appendix W, November 2005). Additional references taken into consideration were the EPA's Meteorological Monitoring Guidance for Regulatory Modeling Applications (February 2000) and guidance documents available through the EPA's Technology Transfer Network Support Center for Regulatory Atmospheric Modeling website at http://www.epa.gov/ttn/scram/.

The air pollution sources that were modeled include the following source categories:

- Process emission points (material handling, crushing, conveying, and leaching)
- Fugitive emission sources (equipment for drilling, blasting, loading, unloading, hauling and removing topsoil, wind erosion, and mobile machinery tailpipes)
- Operational sources (facility activities and emergency generators)

Air pollutant emission estimates were calculated for each source category and emissions-generating activity. The estimates were based on the reasonably foreseeable maximum operational rates for each applicable period, using EPA-approved AP-42 emission factors or manufacturers' guaranteed emission factors. For instances where operational uncertainty allowed for multiple development options, all options were analyzed and the maximum emissions generated from any operational scenario were reported.

Table 4-1, Proposed Action Aggregated Emissions (Tons per Year), shows the aggregate criteria pollutant emissions generated by the proposed action in tons per year. Only criteria air pollutant impacts were assessed as part of the modeling analysis due to the limited amount of hazardous air pollutant emissions generated by the proposed action or alternatives. Detailed emissions and calculations associated with all operational activities are available in the Technical Support Document for the atmospheric dispersion modeling

Table 4-1
Proposed Action Aggregated Emissions (Tons per Year)

	TSP	PM_{10}	$PM_{2.5}$	NOx	VOC	CO	SO_2	CO_{2e}
Construction	576	204	23	32	2.4	19	0.02	2,851
Process operations	723	226	22	584	48	595	0.44	35,418
Point source operations	148	59	14	28	2.4	5	3.3	5,270
Total	**1,447**	**489**	**59**	**644**	**53**	**619**	**3.8**	**43,539**

(Stantec 2015). This document also provides a full description of model selection, meteorological inputs, modeling assumptions, and modeling method for the atmospheric dispersion modeling (Stantec 2015). **Table 4-1** includes emissions for the construction phase of the expansion as well as the emissions associated with permitted stationary point sources and non-stationary or process emissions sources (e.g., material handling, haul trucks, and ancillary mine vehicles).

4.2.2 Impact Indicators

The project would increase emissions of regulated pollutants from the operation of stationary and mobile equipment regularly used in the mining process. The method used in this EIS analyzes the impacts from the entire mine operations after implementation of the expansion activities outlined in the proposed action.

The following are indicators of impacts on air quality:

- A change in air pollutant emissions
- A change in ambient air quality based on atmospheric concentrations of regulated pollutants

The following sections detail the analysis method used to determine impacts on air resources and a quantitative description of these impacts.

4.2.3 Nature and Type of Effects

Direct Effects

Atmospheric pollutant concentrations result from the direct emissions of pollutants from the activities associated with the proposed action and action alternatives. The modeled concentrations predicted by project emissions are presented as the direct effects of the proposed action and alternatives. These effects are detailed in the following sections.

Indirect Effects

In addition to direct atmospheric pollutant concentrations, the proposed action and alternatives can produce associated changes in the atmosphere. These effects, such as changes in the global radiative budget due to GHG pollutant emissions, are considered as the indirect effects of the project; they are detailed in the following sections.

4.2.4 Alternatives Analysis

Proposed Action

Direct and Indirect Impacts

The proposed action would include activities with the potential to emit air pollutants. A comprehensive list of the sources of air pollutant emissions resulting from the proposed action are presented in Technical Support Document for AERMOD Modeling of Ambient Air Quality Impacts, Section 6 (Stantec 2015).

The results of the AERMOD dispersion modeling for the proposed action of POA 10 are presented in **Table 4-2** through **Table 4-6**. These tables, reflecting various phases of the proposed action, show the highest modeled results at any point of public access for all pollutant averaging time combinations (based on the design value), the background pollutant concentration for the pollutant, and the lowest applicable standard (NAAQS) for each of the pollutant averaging time combinations.

Table 4-2
Stage HLP III Operation and Access Road Construction

Pollutant	Averaging Period	Background ($\mu g/m^3$)	Model Results Stage HLP III Operation, Road Construction ($\mu g/m^3$)	Total ($\mu g/m^3$)	NAAQS Standard ($\mu g/m^3$)	Percent of Standard
$PM_{2.5}$[a]	24-hour	7	12.90	19.90	35	56.87
$PM_{2.5}$[d]	Annual	2.4	2.82	5.22	12	43.50
PM_{10}[b]	24-hour	10.2	95.99	106.19	150	70.79
SO_2[c]	1-hour	0	36.89	36.89	196	18.82
SO_2[d]	3-hour	0	21.46	21.46	238	9.02
NO_2[a, e]	1-hour	0	173.05	173.05	188	92.05
NO_2[d, e]	Annual	0	14.98	14.98	100	14.98
CO[d]	1-hour	0	1,534.52	1,534.52	40,000	3.84
CO[d]	8-hour	0	771.65	771.65	10,000	7.72

[a] 8th high value averaged over modeled period (with plume depletion for particulates)
[b] Highest 3rd high over two years modeled (with plume depletion)
[c] 4th high value averaged over two years modeled
[d] Highest 1st high (averaged over two years modeled for $PM_{2.5}$)
[e] Using ozone limiting method

Table 4-3
Stage III Operation, Stage V Construction, and Topsoil Removal/Piling

Pollutant	Averaging Period	Background ($\mu g/m^3$)	Model Results Heap 3 Op, Heap 5 Construct ($\mu g/m^3$)	Total ($\mu g/m^3$)	NAAQS Standard ($\mu g/m^3$)	Percent of Standard
$PM_{2.5}$[a]	24-hour	7	21.54	28.54	35	81.54
$PM_{2.5}$[d]	Annual	2.4	5.05	7.45	12	62.05
PM_{10}[b]	24-hour	10.2	101.27	111.47	150	74.31
SO_2[c]	1-hour	0	36.97	36.97	196	18.86

Table 4-3
Stage III Operation, Stage V Construction, and Topsoil Removal/Piling

Pollutant	Averaging Period	Background (µg/m³)	Model Results Heap 3 Op, Heap 5 Construct (µg/m³)	Total (µg/m³)	NAAQS Standard (µg/m³)	Percent of Standard
SO_2[d]	3-hour	0	21.47	21.47	238	9.02
NO_2[a,e]	1-hour	0	184.22	184.22	188	97.99
NO_2[d, e]	Annual	0	17.60	17.60	100	17.60
CO[d]	1-hour	0	1,622.69	1,622.69	40,000	4.06
CO[d]	8-hour	0	841.98	841.98	10,000	8.42

[a] 8th high value averaged over modeled period (with plume depletion for particulates)
[b] Highest 3rd high over two years modeled (with plume depletion)
[c] 4th high value averaged over two years modeled
[d] Highest 1st high (averaged over two years modeled for $PM_{2.5}$)
[e] Using OLM

Table 4-4
Stage V Operation, with Use of the New Stage V Conveyer, and Concurrent Construction of the Stage IV Expansion

Pollutant	Averaging Period	Background (µg/m³)	Model Results Heap 5 Op, Heap 4 Construct (µg/m³)	Total (µg/m³)	NAAQS Standard (µg/m³)	Percent of Standard
$PM_{2.5}$[a]	24-hour	7	20.09	27.09	35	77.41
$PM_{2.5}$[d]	Annual	2.4	4.57	6.97	12	58.10
PM_{10}[b]	24-hour	10.2	129.08	139.28	150	92.86
SO_2[c]	1-hour	0	36.93	36.93	196	18.84
SO_2[d]	3-hour	0	21.47	21.47	238	9.02
NO_2[a,e]	1-hour	0	180.42	180.42	188	95.97
NO_2[d, e]	Annual	0	16.87	16.87	100	16.87
CO[d]	1-hour	0	1,602.94	1,602.94	40,000	4.01
CO[d]	8-hour	0	797.20	797.20	10,000	7.97

[a] 8th high value averaged over modeled period (with plume depletion for particulates)
[b] Highest 3rd high over two years modeled (with plume depletion)
[c] 4th high value averaged over two years modeled
[d] Highest 1st high (averaged over two years modeled for $PM_{2.5}$)
[e] Using ozone limiting method

Table 4-5
Particulate Concentrations from Development of All Ancillary Facilities, Final Construction and Disturbance Regions

Pollutant	Averaging Period	Background (µg/m³)	Model Results Miscellaneous Construction, Road (µg/m³)	Total (µg/m³)	NAAQS Standard (µg/m³)	Percent of Standard
$PM_{2.5}$[a]	24-hour	7	6.27	13.27	35	37.91
$PM_{2.5}$[d,c]	Annual	2.4	0.43	2.83	12	23.57
PM_{10}[b]	24-hour	10.2	99.36	109.56	150	73.04

[a] 8th high value averaged over modeled period
[b] Highest 3rd high over two years modeled
[c] Annual $PM_{2.5}$ includes plume depletion
[d] Highest 1st high (averaged over two years modeled for $PM_{2.5}$)

Table 4-6
Emergency Generators

Pollutant	Averaging Period	Background ($\mu g/m^3$)	Model Results Emergency Generators ($\mu g/m^3$)	Total ($\mu g/m^3$)	NAAQS Standard ($\mu g/m^3$)	Percent of Standard
$PM_{2.5}$[a]	24-hour	N/A	N/A	N/A	N/A	N/A
$PM_{2.5}$[d]	Annual	N/A	N/A	N/A	N/A	N/A
PM_{10}[b]	24-hour	N/A	N/A	N/A	N/A	N/A
SO_2[c]	1-hour	0	34.13	34.13	196	17.41
SO_2[d]	3-hour	0	34.04	34.04	238	14.30
NO_2[a,e]	1-hour	0	108.24	108.24	188	57.57
NO_2[d, e]	Annual	0	2.93	2.93	100	2.93
CO[d]	1-hour	0	5.04	5.04	40000	0.01
CO[d]	8-hour	0	1.99	1.99	10000	0.02

[a] 8th high value averaged over modeled period (with plume depletion for particulates)
[b] Highest 3rd high over two years modeled (with plume depletion)
[c] 4th high value averaged over two years modeled
[d] Highest 1st high (averaged over two years modeled for $PM_{2.5}$)
[e] Using ozone limiting method

PM_{10} and $PM_{2.5}$ Emissions and Modeled Concentrations

PM_{10} and $PM_{2.5}$ emissions are generated by almost all on-site emissions sources. The major sources are suspended unpaved road dust from haul trucks and other vehicle traffic, wind erosion from disturbed mine regions, ore processing, material handling and sizing using crushers, screens and conveyors, and blasting operations.

Emission controls such as water sprays, bag houses, and cartridge filters help minimize emissions from the material process equipment (crushers, screens, and conveyors), while surface watering and chemical treatments help minimize emissions from unpaved roads, windblown dust, and material transportation.

As described previously, the direct impact on air quality is predicted by the maximum modeled ambient pollutant concentration from the modeling analysis. For PM_{10}, the maximum concentration includes background concentrations plus the operational scenario with the highest modeled impact (Stage V heap operation with Stage IV heap expansion construction). At any point of public access under this scenario, the maximum predicted impact from POA 10 is 139.28 $\mu g/m^3$ for the 24-hour averaging period.

For $PM_{2.5}$, including background concentrations, for the operational scenario with the highest modeled impact (Stage III heap operation with Stage V heap construction) at any point of public access, the maximum predicted impact from POA 10 is 28.54 $\mu g/m^3$ for the 24-hour averaging period and 7.45 $\mu g/m^3$ annual arithmetic average.

The indirect impact of particulate emissions includes dust deposited on vegetation, which would lower its productivity.

Emissions of PM_{10} and $PM_{2.5}$ associated with POA 10 would be generated by numerous processes as a result of the proposed action: the suspension of road dust, wind erosion of exposed dirt surfaces, and activities related to the processing of ore materials. These activities are inherent to the mining process and would be ongoing throughout the life of the proposed action. The direct impact on air quality is quantified in the modeled PM_{10} and $PM_{2.5}$ concentrations, which show levels below the NAAQS.

Gaseous Pollutant Emissions and Modeled Concentrations

Combustion of fuel in machinery can produce elevated ambient levels of CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$. Examples include diesel fuel combustion from ore and waste rock haul trucks and from mobile equipment such as loaders and dozers; blasting combustion; propane combustion in processing units such as furnaces; and fuel oil or diesel combustion in units such as the generators.

The direct impact on air quality from fuel combustion is represented by the maximum modeled concentrations of the gaseous pollutants CO, NO_2, and SO_2. Although PM_{10} and $PM_{2.5}$ are a potential byproduct of combustion, the emission levels associated with combustion are much less than the emission levels from mining and material handling.

Carbon monoxide

The maximum predicted impact from POA 10 is 1,622.69 µg/m³ for the 1-hour averaging period and 841.98 µg/m³ for the 8-hour averaging period. This is calculated for CO, including background concentrations, for the operational scenario with the highest modeled impact (Stage III heap operation with Stage V heap construction) at any point of public access.

Sulfur dioxide

The maximum predicted impact from POA 10 is 36.97 µg/m³ for the 1-hour averaging period and 21.47 µg/m³ for the 3-hour averaging period. This is calculated for SO_2, including background concentrations, for the operational scenario with the highest modeled impact (Stage III Heap Operation with Stage V Heap Construction) at any point of public access.

Nitrogen dioxide

The maximum predicted impact from POA 10 is 184.22 µg/m³ for the 1-hour averaging period and 17.6 µg/m³ for the annual averaging period. This is calculated for NO_2, including background concentrations, for the operational scenario with the highest modeled impact (Stage III Heap Operation with Stage V Heap Construction) at any point of public access.

The modeled combustion emissions for the proposed action result in CO, NO_2, and SO_2 concentrations at levels below the NAAQS; as a result, the direct impacts from the proposed action would not exceed the NAAQS for any gaseous pollutant. Indirect impacts associated with fuel combustion include the production of GHG emissions. These impacts are detailed in a following section.

Hazardous Air Pollutants Emissions

Hazardous air pollutant (HAP) emissions from the proposed action would result from the following:

- Handling of ore and waste rock
- Combustion of hydrocarbon fuels
- Emissions from thermal sources, such as the on-site retort
- Handling and storage of various chemicals

A summary of HAP emissions that would be emitted from the proposed action is presented in **Table 4-7**. The facility-wide HAP emissions would be 0.95 ton per year. These estimated emissions include both fugitive and process sources. EPA thresholds for any single HAP or all HAPs combined are 10 and 25 tons per year, respectively. With the exception of lead, there are no ambient air quality standards for HAPs, and these emissions would not rise to the level of significance.

Table 4-7
Proposed Action Aggregated Hazardous Air Pollutant Emissions

	HAPs (Tons per Year)
Proposed action-construction	0.07
Process operations	0.72
Point source operations	0.15
Total	**0.95**

Climate Change Effects

Recent publications in the scientific literature indicate there is a direct correlation between global warming and emissions of GHGs. This was most recently documented in the 2013 report of the Intergovernmental Panel on Climate Change (IPCC).

GHGs include CO_2, methane, NO_X (nitrogen oxides), and ozone. GHGs also include water vapor, which is generally not considered in GHG calculations, although it is a dominant GHG. Many of these gases occur naturally in the atmosphere; however, man-made sources have substantially increased the emissions of GHGs over the past several decades. Of the man-made GHGs, excluding water vapor, the greatest contribution is from CO_2 emissions.

The EPA tracks GHG emissions in the United States by source sector (e.g., industrial, land use, and electricity generation), fuel source (e.g., coal, natural gas, geothermal, and petroleum), and economic sector (e.g., residential, transportation, commercial, and agriculture). Data are further refined by the emissions (e.g., carbon dioxide, methane, and nitrous oxide) and their carbon

dioxide equivalents. CO_{2e} is the equivalent of CO_2 required to have the same global warming impact as the combined emissions of various GHGs.

Table 4-8 shows the combined GHG emissions from the proposed action. The direct effect would be the emission of 43,539 tons per year of GHG, as measured in CO_{2e}. This is the equivalent of 39,498 metric tons.

Table 4-8
Proposed Action Aggregated GHG Emissions in CO_{2e}

	CO_{2e} (Tons per Year)
Proposed action-construction	2,851
Process operations	35,418
Point source operations	5,270
Total	**43,539**

CO_{2e} emissions from the proposed project would increase US CO_{2e} emissions by 0.00065 percent. At the national scale, this would be a negligible impact.

The social cost of carbon is an estimate of the anticipated future damages from GHG emissions. The social cost of carbon from the proposed action is discussed in **Section 4.6**, Social Values and Economic Values.

Residual Impacts
No residual impacts are expected to occur as a direct result of the proposed action on air and atmospheric resources. This is because all atmospheric emissions would cease once the proposed action activities cease.

No Action Alternative

Direct and Indirect Impacts
As a result of the No Action Alternative, the existing and authorized CRI project would continue to operate under current operational conditions. Current mine operations are regulated by two State of Nevada air quality permits: Air Quality Operating Permit No. AP1044-0063.04 and the Phase II Mercury Operating Permit to Construct No. AP1044-2242.

Air emissions and direct and indirect impacts on the ambient air quality from the existing project are not expected to increase over current levels and are similar to those of the proposed action.

Criteria Pollutant Impacts
The impacts associated with the No Action Alternative have been modeled for compliance with the NAAQS as a component of the state air quality permitting process. This process determined that the facility, as presently operated, would not produce ambient pollutant concentrations that exceed the Nevada ambient

air quality standards. The current emissions are outlined in **Table 3-6**, Coeur Rochester Mine Emissions, in **Chapter 3**.

Additionally, an air quality analysis was completed for the previously approved plan of operations amendment (POA 8) NEPA review process. That modeling also indicated that the facility would not exceed any of the Nevada or national ambient air quality standards that were in place at the time of the review.

Hazardous Air Pollutants Emissions
HAP emissions from the No Action Alternative are similar to those from the proposed action. They would result from the handling of ore and waste rock, the combustion of hydrocarbon fuels, the emissions from thermal sources like the on-site retort, and the handling and storage of various chemicals.

The direct impact from the existing facility-wide HAP emissions would be at a similar rate or lower rate than the proposed action. Emissions for HAPs from the existing operations have been permitted with the Nevada Bureau of Air Pollution Control; however, the permitted emission rates represent only the existing thermal units at the facility. These emissions would have an incidental but not significant impact on the air quality in the vicinity of the project area.

Alternative 1—Permanent Management of PAG Material Outside of the Rochester Pit
Under Alternative 1, material haul travel would be slightly reduced from the levels analyzed for the proposed action. As a result, emissions associated with this alternative would be similar to or slightly lower than those described for the proposed action.

4.3 CULTURAL RESOURCES

Cultural resources would be directly and indirectly impacted by the proposed action.

4.3.1 Analysis Method

Impacts on cultural resources were assessed based on the degree the proposed action could adversely affect the following:

- Cultural resources listed on the NRHP
- Cultural resources eligible for listing on the NRHP
- Cultural resources unevaluated for listing on the NRHP

In accordance with 36 CFR, Part 800.16(i), a property would be affected if its NRHP qualifying characteristics were to be altered. For this reason, it is necessary to know why the property is significant and which of its elements contribute to that significance. Significant impacts on historic properties are usually irreversible.

Class III cultural resource surveys or inventories have been conducted in the APE. This includes all areas proposed for direct impacts as well as portions of the NRHP-eligible RCD and the townsite of Panama located outside the proposed disturbance area. Both the RCD and the historic townsite of Panama have been determined eligible for the NRHP under criterion A; the Panama townsite is also eligible under criterion D. Therefore, potential impacts on the integrity of setting and feeling of these eligible sites were taken into account in determining the boundaries for the APE.

Stoner and Wriston (2015) used GIS analysis to determine which portions of the NRHP-eligible Rochester Cultural District and Panama townsite would potentially be visually impacted. GIS analyses of the line-of-sight, topography, and height of proposed facility improvements were used to delineate the visual impacts of the POA 10 expansion on the Rochester Cultural District and the Panama townsite. The visual impacts of the existing mine were also taken into account in this analysis. Key Observation Points (KOPs) were established by the BLM within the Panama townsite and within the recommended NRHP-eligible site CrNV-02-12598 recorded within the northern Rochester Cultural District (CrNV-02-12593/D177). Stoner and Wriston (2015) assessed indirect effects on these sites using Visual Effects Assessment Forms and photo-documentation.

4.3.2 Impact Indicators

In evaluating the impacts of the proposed action and alternatives on cultural resources, it is necessary to determine whether any part of the proposed action would adversely affect those cultural resources listed on or eligible for listing on the NRHP, as defined in 36 CFR, Parts 800.5(a)(1) and 800.5(a)(2).

An impact occurs when the proposed action would directly or indirectly alter any of the qualities of that property that qualified it for inclusion on the NRHP; an example is the diminished integrity of the property's location, design, setting, materials, workmanship, feeling, or association. In addition to the impacts caused by the initial construction and operation, the proposed project impacts may include reasonably foreseeable adverse effects later in time, may be farther removed, or may be cumulative.

4.3.3 Nature and Type of Effects

Direct Impacts

Direct impacts anticipated from the proposed project on cultural resources are as follows:

- Physical destruction of or damage to all or part of an NRHP-eligible site or district
- Change in the character of the physical features in the property's setting or its use that contributes to its historic significance

- Removal of the property from its historic location unless approved by the agency and conducted consistent with a treatment plan

Indirect Impacts

The indirect impacts anticipated from the proposed project on cultural resources include the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features (36 CFR, Parts 800.5[a][1] and 800.5[a][2]). Other indirect impacts could occur from increased visitation by CRI employees and contractors to areas with historic properties and unauthorized collection of artifacts.

4.3.4 Alternatives Analysis

Proposed Action

The proposed expansion of the mine and associated facilities have the potential to impact cultural resources directly, indirectly, and cumulatively.

Direct and Indirect Impacts

Of the 14 known sites in the APE (both the Direct Effects APE and the Indirect Effects APE), one multicomponent site has been determined eligible for listing on the NRHP in the Direct Effects APE and two historic sites have been determined eligible for listing on the NRHP in the Indirect Effects APE (Stoner and Wriston 2015).

The NRHP-eligible prehistoric component of multicomponent site CrNV-22-3545/26PE1038 would be directly impacted by the proposed action. Three prehistoric loci that contribute to this site's NRHP eligibility would be impacted by the Stage V HLP expansion and e-cell construction (**Table 4-9**). The NRHP-eligible historic townsite of Panama (CrNV-02-401), would be indirectly (visually) impacted by the proposed Limerick Canyon borrow pit. The townsite's NRHP integrity of setting and feeling would be impacted (**Table 4-9**; Stoner and Wriston 2015).

Although the historic site of CrNV-02-12598 has been determined to be a contributing element of the NRHP-eligible Rochester Cultural District (CrNV-02-12593) and the proposed action falls within the viewshed of this site, the proposed project would not impact the NRHP values of this site. Visual analysis from a KOP established at the site determined that the existing Coeur Rochester waste pile dominates the visual landscape; therefore, the proposed power line would not be noticeable to the casual observer. There would be some residual audio and atmospheric impacts on the integrity of the RCD and CrNV-02-401 setting. No other known NRHP values would be impacted.

In accordance with the NHPA, there would be direct and indirect adverse impacts on these sites even if mitigated. However, the intensity of adverse impacts would be reduced through BLM-proposed mitigation, as outlined in Section 6.1, which includes development and implementation of a treatment plan.

Table 4-9
Potential Project Impacts on Eligible Sites

BLM Site Number	NRHP Eligibility	Site Type	Impact	Type of Impact
CrNV-22-3545	Eligible: Criterion D	Multicomponent complex prehistoric assemblage; historic mining-related features and debris	Direct	Stage IV and V HLP expansion, e-cell construction, power line removal
CrNV-22-401	Eligible: Criteria A and D	Historic townsite	Indirect	Visual impact on integrity of setting and feeling by proposed borrow pit

Additionally, as outlined under the environmental protection measures (**Section 2.2.10**) and BLM-proposed mitigation (**Section 6.1.1**), CRI would train its employees and contractors about the illegality and consequences of knowingly disturbing cultural resources or collecting artifacts. Therefore, indirect impacts from unauthorized collection would be minimized.

Adverse effects on the prehistoric site would be reduced but not eliminated under the NHPA.

Mitigation Measures
Section 6.1 outlines the BLM-proposed mitigation. It includes developing a treatment plan to address the direct and indirect effects on the eligible sites in the APE and training CRI employees and contractors about cultural resources. The treatment plan will outline the details of the interpretive panel to be on exhibit at the Marzen House Museum.

No Action

Direct and Indirect Impacts
Under the No Action Alternative, mining and ore processing would continue in the existing authorized project area based on current authorizations in the previously approved plans of operation and reclamation and closure plans. These activities would affect only those historic properties that have been previously mitigated or that have been identified as needing treatment to mitigate impacts.

Alternative 1—Permanent Management of PAG Material Outside of the Rochester Pit
Direct and indirect impacts on cultural resources from implementing Alternative 1 are the same as those described for the proposed action.

Mitigation Measures
As the direct and indirect impacts of Alternative 1 are the same as the proposed action, mitigation measures described in Chapter 6 would apply for Alterative 1.

4.4 MIGRATORY BIRDS

Migratory birds nest and forage in the project area. Special status birds are discussed in **Section 4.8**, Special Status Species, and general wildlife are discussed in **Section 4.10**, Wildlife.

4.4.1 Analysis Method

Potential effects on migratory birds may be direct or indirect and would occur during the life of the project and afterwards. Direct impacts are those that would result in the injury or mortality of a migratory bird or loss of an active nest. Indirect impacts are the degradation of migratory bird habitat to the extent that population numbers decline. Long-term impacts are those occurring after reclamation.

4.4.2 Impact Indicators

Impact indicators include the following:

- Acres of lost nesting and foraging habitat
- Loss of birds or nests protected by the MBTA
- Project features that could pose a risk of injury, mortality, or increased predation

4.4.3 Nature and Type of Effects

Direct Effects

Direct impacts on migratory birds are direct loss of nests from crushing, injury or mortality from construction or mining equipment, loss of burrow or roost habitat from ground disturbance, or harm from noise or light in the vicinity of habitat. Mining activities, road and pad construction, and drilling equipment operation could disturb wildlife year-round through the presence of humans and by removing vegetation and upper soil layers and generating noise and dust.

Birds may also die from electrocution or collision with power lines. Electrocution occurs when a bird comes in contact with two energized lines simultaneously, an energized part and a grounded part of electrical equipment, or if the collision causes two lines to come into contact or become close enough to arc; as such, larger birds are more vulnerable to electrocution (APLIC 2012). Vulnerability to collision depends on many factors, including bird behavior and maneuverability, topography, weather, and power line design and placement. Collision risk is highest in areas where birds congregate, such as power lines that bisect daily flight paths. The open landscapes closer to where birds might congregate, such as playa habitats, likely have greater risk than areas already containing significant topographic obstacles that birds must navigate around (APLIC 2012), such as that in the project area.

Indirect Effects

Potential indirect effects from the proposed action include displacement or nest abandonment from increased noise and human presence close to an active nest site.

Foraging birds are unlikely to be disturbed by construction and operational noise, as they would be likely to avoid noisy areas and forage elsewhere.

Avian species, typically raptors, take advantage of power lines, distribution poles, and trees, which provide viewing advantages and increase hunting success. Power line poles may also provide suitable nesting structures for birds. New or relocated power lines near migratory bird nesting sites may increase nesting by raptors (birds of prey) or corvids (such as crows and ravens), which would increase predation in habitat directly surrounding the nest and potentially result in a decline in nesting success of migratory birds that serve as prey.

4.4.4 Alternatives Analysis

Proposed Action

Direct and Indirect Impacts

The proposed action would directly affect migratory bird habitat by removing vegetation in areas proposed for surface disturbance, and by increasing human and equipment presence in habitat areas or close to active nest sites. These impacts would remove available nesting and foraging habitat. Biological surveys have shown migratory birds nesting in the project area, including great horned owl and red-tailed hawk, and others in the vicinity of the project area boundary, including golden eagles.

There is also a potential for injury or mortality to increase from the increased vehicular traffic associated with the proposed action. Due to the expansive amount of available habitat in adjacent areas, no impacts on regional populations are likely to result from the proposed action.

Injury or mortality of migratory birds from crushing by construction or mining equipment or vehicles, or loss of burrow or roost habitat from ground disturbance from the proposed action, is expected to be low because most migratory birds would avoid areas of disturbance.

There is the potential for injury or mortality of migratory birds poisoned, mainly by ingesting solution in industrial ponds, which can attract wildlife in the arid Great Basin (Clark and Hothem 1991) for drinking and foraging (O'Shea et al. 2000). However, potential sources of open water are fenced, covered, or otherwise restricted from wildlife access, as described in **Section 2.2.10**, Environmental Protection Measures.

American Canyon Spring provides a potential water source for migratory birds in the project area. Under the proposed action, American Canyon Spring would be directly impacted by constructing a new Stage V HLP. Water from the spring would be collected under the HLP, and various water quality metrics would be tested (see **Chapter 2**). If water quality were to fail standards, this water would not be released. Water that meets standards would be released in the stormwater conveyance system; eventually it would be discharged into the ephemeral stream in American Canyon, approximately 0.5 mile to the north.

As described in **Section 4.5**, Water Resources, the proposed action may reduce groundwater recharge in the American Canyon Spring area by 22 gpm; this could reduce the volume of water discharged by the spring and released into the ephemeral stream in American Canyon. Water discharged into American Canyon would still represent a potential water source and insect prey base for migratory birds that may easily move longer distances in search of water or prey. Two additional springs in the project area would not be disturbed by the proposed action.

The loss of habitat is temporary in most locations because surface disturbed by the proposed action would be reclaimed or revegetated, with the exception of the main access road to the mine facilities, public access roads, contingency ponds, and closure e-cells. Surface disturbance subject to revegetation would be seeded with a BLM-approved seed mix. The mix would contain native seeds or plants that are compatible with native soils in the project area and forb and shrub species to provide forage for wildlife, including migratory birds.

Approximately 3.1 miles of power lines would be relocated as part of the proposed action. Potential impacts from power lines, including electrocution, would be minimized by implementing the environmental protection measures listed in **Chapter 2**. There is potential for increased risk of predation from the existing power transmission line being relocated in the project area to a new area. Although it is an existing power transmission line, the migratory birds in the area where the power transmission line would be relocated has risk of increased predation from raptors using the power poles as perch sites. The migratory birds within the area that would have the power transmission line removed may experience decreased risk of predation from the removal of perch sites.

Mining, drilling, and construction noise may disturb birds nesting in the vicinity of the proposed project, resulting in nest abandonment. During construction, noise would be greatest near construction sites and would be diminish with distance from the noise source.

Additional direct and indirect impacts are the risk of drowning, the risk of increased disease transmission, and habitat fragmentation, as described in the wildlife section (**Section 4.10.4**); these risks would also apply to migratory birds.

Potential impacts from the proposed action would be minimized by implementing the environmental protection measures listed in **Chapter 2**. Before the surface is disturbed during the nesting season (March 1 through August 31), the area would be surveyed to ensure no nests with eggs or young are present. If such nests are found, they would be avoided by an appropriate distance to prevent destroying the nest and disturbing the nesting birds. To protect raptors, standard raptor protection designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2012), would be incorporated into the design and construction of power lines.

Residual impacts on migratory birds and raptors include direct impacts on approximately 371 acres[1] of sagebrush shrubland and juniper savanna nesting and foraging habitat, representing approximately 14 percent of sagebrush shrubland and juniper savannah habitat in the project area. Removing vegetation on these lands would result in a loss of breeding and foraging habitat for migratory birds.

This acreage would not all be disturbed at one time due to incremental mining and interim reclamation. Reclaimed land would have more grass and forb forage and less mature shrub forage in the short term, which may result in a shift of avian species use within these areas. As the plant communities within reclaimed areas mature, larger shrubs may provide additional cover and nesting opportunities. Pit walls that would not be reclaimed may result in an increase in cliff nesting habitat for raptors. An increase in cliff nesting habitat for raptors may, in turn, result in increased predation and mortality on migratory birds that serve as prey for raptor species.

Approximately 24 acres of sagebrush shrubland and juniper savannah habitat would not be reclaimed following mine closure, as these areas would be impacted by contingency ponds, closure e-cells, or portions of the pit walls (see **Figure 2-9**). This represents a permanent impact of less than one percent of migratory bird breeding and foraging habitat in the project area.

Though the proposed action would result in a net loss of 24 acres (less than one percent) of breeding and foraging habitat for migratory birds, it would not contribute to a loss of viability for any migratory bird species. This is because most mining would be concentrated near previously disturbed areas, extensive similar habitat is available within and adjacent to the project area, and environmental protection measures, including breeding bird surveys, would further reduce impacts on migratory birds.

[1] Impacts include both acres of vegetation that could be impacted by the proposed action in addition to acres of vegetation in areas authorized for disturbance. Total impacts excluding acres of disturbed or recently mined or quarried areas are 371 acres.

No Action

Direct and Indirect Impacts
Under the No Action Alternative, the CRI mine operations would continue under existing plans and there would be no expansion. Reclamation and mining would continue based on current authorizations in previously approved plans of operation. Mining would continue to allow up to 1,939 acres of authorized disturbance in the existing authorized mine plan boundary, and reclamation and closure would continue based on existing approved authorizations.

Operation under the No Action Alternative would continue to directly affect migratory birds by removing vegetation in areas proposed for surface disturbance. Most of the surface disturbance associated with the No Action Alternative would be reclaimed, with the exception of the open pits and the main access road to the mine facilities and the public access roads. Indirect impacts would be similar to those described for the proposed action.

Alternative 1—Permanent Management of PAG Material Outside of the Rochester Pit
Alternative 1 would store PAG material permanently on the West and North RDSs, and reclaim it in place. The proposed storage location would be on disturbed land that does not provide wildlife habitat. The type of disturbance and impacts under Alternative 1 are similar to those described for the proposed action.

4.5 WATER QUALITY (SURFACE AND GROUND)

The direct and indirect effects study area for surface and groundwater quality is defined by the three hydrographic basins that the mine straddles. Surface water and groundwater at the mine site drains to the following hydrographic basins (SWS 2015):

- The American and South American Canyon watersheds, which both drain eastward into the Buena Vista Valley Hydrographic Sub-Basin (129) of the Central Region
- The Weaver and Woody Canyon areas, which drain southward into the Packard Wash of the Packard Valley Sub-Area (101A) of the Carson Desert Sub-Basin (101) of the Carson River Basin and eventually into the Carson Sink
- The Limerick and Rochester Canyon watersheds, which drain to the west into the Oreana Sub-Area (73A) of the Lovelock Valley Hydrographic Sub-Basin (73) of the Humboldt River Basin

4.5.1 Analysis Method

SWS assessed the water quantity and quality impacts due to the proposed mine plan changes described in POA 10. The impact analysis for the proposed project included both groundwater quantity and quality modeling and analysis of the

potential impacts on surface water quantity and quality. Expansion of the Stage IV HLP and construction of the Stage V HLP would cover recharge zones as well as the American Canyon Spring.

In addition, SRK (2014) reviewed waste rock characterization data that can be used to analyze the potential impacts of a change to the PAG management plan for POA 10. SRK reviewed and validated waste rock characterization data to confirm that the characterization was comparable and suitable for its intended analysis. The closure plan for the existing and proposed facilities in POA 10 was also evaluated for foreseeable impacts on surface and groundwater quantity and quality.

4.5.2 Impact Indicators

The indicators of impacts for water resources are changes to surface or groundwater flows or quality, as follows:

Surface Water

- Degradation of surface water quality to below applicable state or federal regulations designated for beneficial uses, such as municipal or domestic water supply, irrigation, and livestock watering or support of terrestrial, avian, and aquatic life
- Alteration in surface water drainage patterns that accelerate erosion and sedimentation
- Measurable reduction in flow from springs and in surface water drainages that are important for biological resources
- Damage to project facilities and on- and off-site resources during operation or post closure as a result of inadequate drainage control

Groundwater

- Lowering of groundwater levels that may adversely affect water supply and indirectly affect vegetation and forage for wildlife and livestock
- Degradation of groundwater quality downgradient of the project facilities such that one or more water quality constituents would exceed federal primary or Nevada secondary enforceable maximum contaminant levels (these were established to protect human health from potentially toxic or undesirable substances in drinking water)
- Where groundwater already exceeds the maximum contaminant levels for drinking water, the quality would be lowered such that it would render those waters unsuitable for other existing or potential beneficial use

4.5.3 Nature and Type of Effects

This section primarily applies to impacts on local springs and groundwater.

Direct Effects

Direct impacts on surface water quantity are those that increase or decrease runoff and, subsequently, stream flows. Surface water quality is directly impacted by activities that improve or degrade the ambient quality of surface waters.

Direct impacts on groundwater quantity result in changes in groundwater levels by changing the amount of water that infiltrates into the ground or making changes to well pumping. Groundwater quality is directly affected by inputs of water that is of better or poorer quality.

Indirect Effects

Indirect effects on groundwater quality and quantity result from activities that modify the areas or sources that recharge the groundwater system and the quality of that recharge water.

Indirect impacts on surface water are from activities that disturb soil and modify drainages. The distribution and condition of wetlands and riparian areas indirectly change surface water quantity because wetlands and riparian areas affect infiltration and stream flows. Changes in surface water quantity may also affect the water available for vegetation and subsequently the ability for wildlife and livestock to forage.

4.5.4 Alternatives Analysis

Proposed Action

Direct and Indirect Impacts

The proposed POA 10 would include the expansion of HLP IV, construction of HLP V, higher pumping rates from production wells, a longer life for the mine with production pumping during mining from 2014 through 2024, and reduced production pumping during closure and draindown from 2025 to 2029. There is no change proposed for the Rochester pit configuration.

Groundwater Quantity

Potential impacts on groundwater quantity from the proposed action were evaluated using a numerical groundwater flow model (SWS 2015). To simulate the updated mine plan, the groundwater model developed for POA 8 and refined during preparation of the FPCP was expanded. The boundaries for the model were expanded westward to the headwaters of Limerick Canyon, north to Spring Valley, south along the Black Ridge Fault zone (BRF), and southwest toward Packard Wash.

The original conceptual and groundwater models were developed in support of POA 8 in 2010 (SWS 2010a) and were approved by the BLM and NDEP in 2010 and 2011. These models were updated by SWS in 2011 and 2012 for the FPCP, and NDEP approved them in 2012 (SWS 2015). The groundwater model was developed in a manner consistent with BLM guidance (BLM 2008b).

The proposed action includes two scenarios of higher pumping. The first simulates groundwater pumping at an average of 500 gpm through 2024; the second simulates pumping to increase to a maximum of 900 gpm through 2024 (SWS 2015).

There is no direct discussion as to which pumping scenario is more likely and under what conditions either scenario would be implemented. However, historically, the mine uses higher pumping only intermittently as needed for operations (SWS 2015). The following summarizes model predictions for each pumping scenario.

500 gpm Pumping Scenario

Under this scenario, groundwater pumping would average 344 gpm through 2015; it would increase to 400 gpm in 2016, to 450 gpm from 2017 to 2019, and to 500 gpm from 2020 to 2024; then it would reduce to 120 gpm from 2025 to 2029 (SWS 2015). Model results predict that the maximum drawdown would be associated with the water supply wells and would occur at the end of mining in 2024. Incremental drawdown[2] is predicted to range from 60 feet at well PW-2A to 253 feet at well PW-4A.

Maximum drawdown in wells in the BRF is predicted to continue for up to approximately one year after mining ceases. Incremental drawdown in these wells would be up to 156 feet, with maximum drawdown occurring at well MW-45. Wells in the BRF are predicted to recover to 95 percent of pre-mining water levels within 86 years after mining ends (SWS 2015).

Bedrock groundwater not in the BRF is predicted to experience some drawdown from mine-related groundwater pumping. Drawdown would be at a maximum of 9 feet in the Spring Valley area approximately one year after mining ceases; incremental drawdown is predicted to reach a maximum approximately 31 years after mining ceases. Well NP-11 in Packard Wash will have a maximum drawdown of 15 feet. Bedrock groundwater levels near the Lower American Canyon Spring are predicted to decline by up to 15 feet, and those near the South American Canyon Spring are predicted to decline by up to 16 feet (SWS 2015).

In the Rochester pit but outside the BRF, as represented by well MW-49, incremental drawdown is predicted to reach a maximum of 110 feet within a year after mining ends and to have 100 percent recovery approximately 86 years after mining ends.

900 gpm Pumping Scenario

This scenario includes modeling average groundwater pumping of 344 gpm through 2015 and spikes of 800 gpm in 2016, 850 gpm from 2017 to 2019, and

[2]This is defined as the additional predicted drawdown, compared to pumping at 344 gpm through 2018 and then at 120 gpm through 2023.

900 gpm from 2020 to 2024, before reducing to 120 gpm from 2025 to 2029 (SWS 2015). Model results predict that the maximum drawdown would be associated with the production wells and would occur at the end of mining in 2024. Incremental drawdown is predicted to range from 367 feet in well PW-2A to 797 feet in well PW-1A.

Maximum drawdown in other wells in the BRF is predicted to continue for up to approximately one year after mining ceases. Incremental drawdown in these wells would be up to 541 feet. Wells in the BRF are predicted to recover to 95 percent of pre-mining water levels approximately 106 years after mining ends (SWS 2015).

Bedrock groundwater not in the BRF is predicted to experience maximum drawdown in Spring Valley from mine-related groundwater pumping of up to 23 feet three years after mining ceases. Incremental drawdown is predicted to reach a maximum of 32 feet, up to 36 years after mining ends in Packard Wash. Bedrock groundwater levels near the Lower American Canyon Spring are predicted to decline by up to 30 feet 31 years after mining; bedrock groundwater levels near the South American Canyon Spring are predicted to decline by up to 39 feet 31 years after mining (SWS 2015).

In the Rochester pit but outside the BRF, incremental drawdown is predicted to reach a maximum of 344 feet within one year after mining, with water levels recovering approximately 106 years after the end of mining (**Figure 4-1**, POA10 Recovery Water Levels).

Summary of Groundwater Quantity Impacts

Water levels are expected to remain suppressed at or below the top of the backfill surface in the eastern portion of the final pit configuration. This is due to the effect of evapotranspiration at the surface of the pit backfill. A seasonal surface expression on the backfill material may develop during December, January, and February, the months with the highest precipitation. This is a time when precipitation is high and the water demand by vegetation is low. The pit backfill may reach an elevation of 6,175.5 feet amsl after the winter season and will drop to an elevation of 6,173.9 feet amsl after the summer season (July, August, and September), the months with highest evapotranspiration.

The pit backfill is expected to remain a permanent hydraulic sink, with little or no groundwater flowing through the pit backfill material (SWS 2015). The infiltration rate of the waste rock areas is considered to be nearly the same as the infiltration rate attributable to recharge from precipitation. The exception is in the area of the pit backfill, where runoff rates are included (SWS 2015, Figure 4.3). With respect to the encapsulated PAG cells under the Proposed Action, the model infiltration rate is 2.25 inches per year.

The incremental drawdown indicates that the proposed action would lower groundwater elevations in the areas of the Stage IV HLP expansion and in the

Stage V HLP footprint. The HLPs are designed as zero discharge facilities, so the recharge beneath them was set to zero in the model simulations. The resulting lack of recharge in these areas affects the local groundwater levels.

In the alluvial aquifer system in Limerick Valley, incremental drawdown is projected to be up to 15 feet approximately 15 years after mining ends for the 500 gpm pumping scenario and up to 38 feet approximately 20 years post mining for the 900 gpm pumping scenario (SWS 2015). Incremental drawdown of greater than 10 feet in the alluvial aquifer system is projected to extend to the west into the upper portions of Limerick Valley (**Figure 4-2**, End of Mining Incremental Drawdown, POA 10 vs. No Action).

Incremental drawdown at the end of mining of greater than 10 feet in the bedrock system is projected to extend up to 1,800 feet east of the project area. It would include the American Canyon Spring, Lower American Canyon Spring, and South American Canyon Spring (**Figure 4-2**).

Infiltration of precipitation to the alluvium has been observed to be a major source of the water supplying these springs. As such, the potential for impacts from maximum modeled bedrock drawdowns from pumping is expected to be small compared to the alluvial contribution. This supports the conclusion that negligible impacts on the springs are expected from groundwater pumping withdrawals in the bedrock.

Incremental drawdown of greater than 10 feet in the bedrock groundwater system due to groundwater pumping is projected to extend up to 1.4 miles north of the project area to the southern portion of Spring Valley (**Figure 4-2**); maximum drawdown would be one to three years post mining. Spring Valley Springs 1 and 2 are in the limit of the 10-foot incremental drawdown contour but are likely derived from surface water recharge into the alluvial groundwater system and so should not be affected by drawdown in the bedrock aquifer (SWS 2015).

Groundwater Quality

No direct environmental impacts on groundwater quality beyond those observed for the current operations are anticipated from the proposed action. Under the proposed action, similar rock types would be mined and ore would be processed in a similar manner, although the heap leach pads would be expanded to accommodate the additional ore.

The recently installed pump-back system will be evaluated during the course of operations to optimize that system and to contain the existing plume. At closure, pump-back water would be routed into the double-lined e-cells until draindown objectives are met. Additionally, natural attenuation mechanisms, such as iron interactions/uptake and microbial processes, exist in the aquifer, which will aid in reducing contaminant mass.

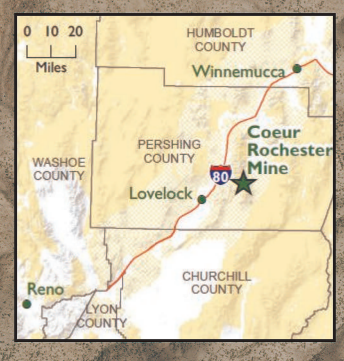
Figure 4-1, POA 10 Recovery Water Levels

Higher pumping scenario recovery water levels, 106 years post-mining

- EIS proposed plan boundary
- Hydrologic model area
- Production well
- Hydrologic flow barrier
- Bedrock groundwater contours (100 ft)
- Bedrock groundwater contours (50 ft)
- Spring/seep
- Backfill zone (below 6175')
- Existing disturbance
- Proposed in-pit PAG storage area
- Proposed areas

Spring Valley Spring 2
Spring Valley Spring 1
Limerick Canyon Spring 3
Limerick Canyon Spring 4
McCarty Spring
Lower American Canyon Spring (LACS)
PW-1A
American Canyon Spring (ACS)
PW-2A
Rochester Pond
Rochester Tule Spring
Rose Spring
Rochester Lower Pond
PW-3A
South American Canyon Spring (SACS)
PW-4A
Weaver Spring 1
Weaver Spring 3
Weaver Spring 2
Mystic Spring
Keath Spring
Packard Gulch Spring
Packard Flat (Artesian)

June 23, 2015
Source: BLM GIS 2014, CRI GIS 2015, NAIP 2013, NV Division of Water Resources GIS 2010, SWS GIS 2015
CRI_IA_RecoveryLevels_V05.pdf
Coeur Rochester EIS, Winnemucca District Office
No warranty is made by the BLM as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



N
0 0.25 0.5
Miles

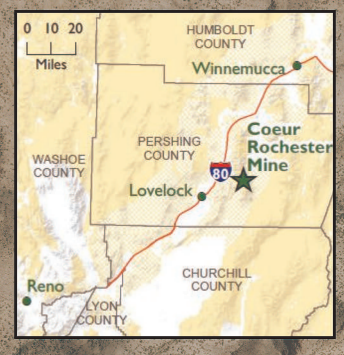
NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT

Figure 4-2, End of Mining Incremental Drawdown (900gpm pumping rate)

- EIS proposed plan boundary
- Hydrologic model area
- Production well
- Hydrologic flow barrier
- Drawdown isopleth (10 ft)
- Spring/seep
- Existing disturbance
- Proposed areas
- Drawdown isopleth (50 ft)

Spring Valley Spring 2
Spring Valley Spring 1
McCarty Spring
Limerick Canyon Spring 4
Limerick Canyon Spring 3
Lower American Canyon Spring (LACS)
American Canyon Spring (ACS)
South American Canyon Spring (SACS)
Rochester Pond
Rochester Tule Spring
Rose Spring
Rochester Lower Pond
Weaver Spring 3
Weaver Spring 1
Weaver Spring 2
Mystic Spring
Keath Spring
Packard Gulch Spring
Packard Flat (Artesian)
PW-1A
PW-2A
PW-3A
PW-4A

June 23, 2015
Source: BLM GIS 2014, CRI GIS 2015, NAIP 2013, NV Division of Water Resources GIS 2010, SWS GIS 2015
CRI_IA_Drawdown_V05.pdf
Coeur Rochester EIS, Winnemucca District Office
No warranty is made by the BLM as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



N
0 0.25 0.5
Miles

The calculated watershed area contributing surface recharge to ACS is approximately 243 acres. The area of the Stage V HLP in the ACS recharge area is approximately 37 acres, which is 15 percent of the recharge area for ACS (SWS 2015). The groundwater quality is not anticipated to degrade as a result of the decrease in recharge. In addition, leak detection, control, and fluid management measures are built into the Stage V HLP design to ensure that ACS water quality is not degraded.

Groundwater migrates toward a groundwater depression associated with the pit that would accumulate salts and constituents as a result of evaporation.

Groundwater quality downgradient of the Rochester pit would continue to be monitored quarterly at monitoring wells MW-45, MW-46, MW-47, and MW-48 (Lewis Environmental Consulting, LLC 2011).

Water quality of other springs, seeps, and wetlands outside of the project area is not expected to be impacted by the proposed action.

Surface Water Quantity

To the extent water is withdrawn from the alluvial aquifer of Limerick Valley, it would reduce the quantity of water discharging to downgradient springs fed by the alluvium. This is an indirect impact. The effects would vary during pumping and groundwater recovery, which is expected to be 95 percent recovered 86 to 106 years after the end of mine life.

The proposed action would result in the American Canyon Spring being covered by the proposed Stage V HLP. The American Canyon Spring and other nearby seeps feed an ephemeral stream that flows during times of high precipitation and snowmelt along the upper American Canyon channel (SWS 2012a). The Stage V HLP would include an under-drain system to capture and convey flows from springs and seep areas. The under-drain system would route flows to a lined stormwater pond. After a sufficient period of monitoring, this water would then be conveyed to the stormwater diversion system that would discharge flows into American Canyon (CRI 2015a). Expanding the Stage IV HLP (67 acres) and creating the Stage V HLP (124 acres) is predicted to reduce recharge from direct precipitation onto these areas by approximately 22 gpm (SWS 2015). This would reduce the source of water that might otherwise discharge to nearby surface water drainages and reduce water quantity.

Runoff from the HLPs would be contained and absorbed into the process circuit. Upon closure, this runoff would be rerouted to the diversions after completion of the HLP reclamation covers. The resulting discharge would be routed through a channel sized to handle a 500-year, 24-hour storm to discharge points in American Canyon and South American Canyon (CRI 2015a). Water quantity at other springs would continue to be monitored and reported according to current permit requirements.

Stormwater flows from the covered HLPs would be routed into ditches and conveyed off-site, and draindown would be diverted to e-cells (CRI 2015c). Therefore, no water from the HLPs would infiltrate the alluvium from which spring flow is derived. Stormwater flows would be conveyed off-site to American Canyon, which is their natural flow path.

Surface Water Quality

SWS (2015) reevaluated the pit backfill water balance and water quality model. Groundwater levels would rebound between 86 and 106 years after the end of mine life, depending on the pumping scenario. The pit is backfilled to 6,175 feet amsl, and the water is predicted to rebound to an annual average elevation of 6,174 feet amsl, with seasonal fluctuations between 6,172.5 and 6175.5 feet amsl. Seasonal fluctuations are created by various evaporation and seasonal rainfall. During the winter, with low evaporation and high rainfall, a seasonal water expression is predicted to elevate the water level to 6,175.5 feet amsl, approximately 0.5 foot above the pit backfill surface.

Before the pit was backfilled in 2011, a pit lake formed and was present from 2007 to 2011. The pit lake water quality was of sodium sulfate type, and the pH was approximately 4.85. Elevated constituents were aluminum, cadmium, copper, iron, lead, manganese, sulfate, thallium, total dissolved solids, and zinc. As a result, in 2011 the mine site amended 17 percent of the backfill with 5,482 tons of lime (9,792 tons of calcite equivalent).

SWS modeled backfill pore water chemistry using the geochemical model PHREEQC (Parkhurst and Appelo 1999). The model applies kinetic test results, such as humidity cell test data, for starting leachate concentrations. It was ultimately calibrated to a groundwater monitoring location in the pit backfill, MW-49, as well as the former pit lake chemistry.

The PHREEQC model accounts for the consumption of lime (used to amend backfill material) as well as adsorption to ferrihydrite and colloids. The predictive model indicates that, from year 25 to 100, the backfill pore water would exceed NDEP reference values for cadmium, manganese, selenium, and thallium (pH of 6.71 to 8.18); at year 200, the water would exceed NDEP reference values for cadmium, manganese, and thallium. The model of the predicted seasonal water expression chemistry indicates that fluoride, boron, and selenium are predicted to exceed the NDEP Profile III standards (SWS 2015).

The model of the predicted seasonal water expression chemistry indicates that fluoride, boron, and selenium are predicted to exceed the NDEP profile III standards.

The primary source of American Canyon Spring surface water is seepage of precipitation through the surrounding colluvium, based on direct observation of seepage and supported by groundwater modeling. The calculated watershed

area contributing surface recharge to American Canyon Spring is approximately 243 acres. The area of the Stage V HLP in the American Canyon Spring recharge area is approximately 37 acres, or 15 percent of the recharge area for American Canyon Spring (SWS 2015, p. 8).

Although part of the American Canyon Spring would be covered by the proposed Stage V HLP, affecting the quantity of discharge to the American Canyon Spring, the quality of water in the American Canyon Spring would not be impacted. This is because the seepage mechanism through local colluvium, which controls water quality, remains unchanged. Stage V HLP would contain cyanide and various metals that would harm water quality in the American Canyon Spring in the event that the process solution leaked to the subsurface.

No impacts from heap leach draindown on South American Canyon Spring and Lower American Canyon Spring are anticipated. This is because the HLPs are engineered to be zero discharge facilities. Engineered zero discharge management includes emplacing engineered covers to reduce precipitation infiltrating the HLPs and routing draindown from the lined HLP facilities to double-lined e-cells. Leak detection, control, and fluid management measures are built into the Stage V HLP design to trigger corrective action if needed.

While the long-term chemistry of the HLP draindown will not meet drinking water standards, the draindown management plan is managed for zero discharge to the environment; therefore, there would be no impact on waters of the state. This is because of the proposed zero discharge management approach, which includes using engineered covers to reduce infiltration and routing draindown from the lined HLP facilities to doubled-lined e-cells. This approach satisfies the conditions of stabilization in NAC 445A.430 and Nevada Revised Statutes 445A.425 and 465.

All ponds used to form e-cells would be backfilled to prevent accumulation and expression of an open pond water surface. The system is designed to allow for gravity drainage through HDPE pipes from the HLP to the e-cells. E-cells can receive excess draindown flow from upset events from the Stages I or III e-cells via gravity drainage or from the Stage II or IV e-cells via pumped routing in pipelines. All buried pipes will have pipe-in-pipe, containment. There is contingency capacity provided in the e-cells beyond the estimated heap draindown rate, in addition to providing for upset conditions associated with the HLP draindown. There is evaporation capacity for the groundwater pump-back facilities. This is to manage impacted groundwater in the shallow alluvium near the Stage I north dike and existing process area ponds and sumps.

The proposed action would not result in changes to the current BMPs used to control stormwater runoff originating from disturbed or undisturbed areas in the project area. The proposed action would follow the SWPPP of 2014. Seeps and springs would continue to be monitored quarterly, according to the CRI mine hydrologic monitoring program and WPCP requirements.

No Action

Direct and Indirect Impacts

Groundwater Quantity

Under the No Action Alternative, the Stage IV HLP would not be expanded, the Stage V HLP would not be constructed, and production well pumping would continue at the 2013 rates during mining from 2014 through 2018, with reduced pumping during closure and draindown from 2019 to 2023. Remediation pumping is assumed to be equal to 2013 rates and would continue through 2055 (SWS 2015).

Historical releases from the Stage I heap leach pad contaminated groundwater. Leakage from the pad was first noticed in 1991, near the north side (HydroGeo 2010). Concentrations of arsenic, mercury, manganese, nitrate/nitrite, TDS, and WAD CN- were measured; they were found to be above the Nevada reference values in WI-16, WI-17R, WI-19, WI-29/R, MW-30/R, MW-35, MW-37, and MW54 (SWS 2014). Well TB-1, downgradient of the stage 1 pad, exceeds Nevada Profile I reference values. The maximum detected concentration at TB-1 between March 2011 and May 2013 was 650 mg/L CN-, 0.075 mg/L arsenic, 3.8 mg/L mercury, and 2,300 mg/L TDS (SWS 2014).

Several corrective action plans have been implemented to remedy the elevated concentrations at Heap Leach Pad I. In December 2013, additional pump-back wells MW-51, MW-52B, MW-53B, and MW-54 were started to supplement the existing catch basin central (CBC) sump and pump-back wells WI-16, WI-17R, and WI-29R (SWS 2014). The sump and pump-back wells lower the groundwater levels and provide hydraulic containment.

The efficiency of the pump-back system remains to be evaluated due to recent installation. At closure, the ET cover will be increased to 18 inches and draindown from the Stage I HLP will be diverted to e-cells E and F (CRI 2014). The plume exists under both the No Action and Proposed Action scenarios. However, the Proposed Action permits recycling WAD cyanide back to mine processes.

Model results predict that the highest drawdown would occur in the BRF and adjacent bedrock aquifer near the mine supply wells at the end of mining in 2018. Drawdown in 2013 in the production wells ranged from 125 to 470 feet, with much smaller drawdown outside the BRF.

Under the No Action Alternative, the groundwater is projected to recover to the elevation of the surface of the pit backfill, or 6,175 feet, in approximately 47 years after the end of mining. Water levels are expected to remain suppressed at or below the top of the backfill surface in the eastern portion of the final pit configuration. This would be due to evapotranspiration at the pit backfill surface.

A seasonal surface expression may develop on the backfill material when precipitation-based recharge is high and the evaporative demand is low.

The pit backfill is expected to remain a permanent hydraulic sink for nearby groundwater that is present at elevations greater than 6,175 feet. As with the proposed action, a groundwater mound is predicted to form to the west of the pit backfill. This mound creates a hydraulic gradient that would allow groundwater beneath the western portion of the pit to flow radially, with approximately half of the groundwater flowing toward the pit backfill hydraulic sink and the remaining groundwater flowing to the north, west, and southwest, toward Rochester and Weaver Canyons.

The predicted post-mining groundwater surface for the No Action Alternative is similar to the post-mining groundwater surface for the proposed action (**Figure 4-1**). Storage area PAG-1 is in the area of the pit where groundwater flows away from the pit. Groundwater beneath storage area PAG-2 flows both towards the pit backfill hydraulic sink and to the west and away from the pit. Groundwater flow rates to the north, west, and southwest are expected to be very low outside of fracture zones due the very low hydraulic conductivity of the unfractured bedrock.

Groundwater Quality

Groundwater quality impacts and trends under the No Action Alternative would remain consistent with present day conditions. Groundwater monitoring and reporting would continue according to current permit requirements.

Surface Water Quantity

The No Action Alternative would not impact surface water quantity. Seeps and springs would continue to be monitored quarterly according to the CRI mine hydrologic monitoring program and water pollution control permit requirements.

Surface Water Quality

The No Action Alternative would not change the current BMPs used to control stormwater runoff from disturbed or undisturbed areas in the project area. Seeps and springs would continue to be monitored quarterly according to the CRI mine hydrologic monitoring program and water pollution control permit requirements. Seep and spring water quality impacts under the No Action Alternative are expected to remain consistent with present day conditions. Monitoring and reporting would continue according to current permit requirements.

Alternative 1—Permanent Management of PAG Material Outside of the Rochester Pit

Direct and Indirect Impacts

Alternative 1 would permanently store PAG materials on top of and in the footprint of the West and North RDSs. PAG would be stored on top of a

minimum of 50 feet of non-PAG material and would be covered with 20 feet of material (SRK 2014; Lewis 2011). Impacts on groundwater and surface water quantity would be the same as described for the proposed action.

Groundwater Quality

PAG placed under 20 feet of cover has minimal potential to oxidize. As such, the waste rock would behave like native materials that are the current source for groundwater constituents. Thus, the potential to degrade groundwater quality is low when the PAG is managed to minimize oxidation.

Surface Water Quality

The waste rock in the catchment of Rochester Canyon is unlikely to produce a toe seep, based on past performance of waste rock at the mine. However, influences on groundwater would eventually flow to Rochester Canyon surface water. The high native manganese concentrations in groundwater, when oxidized, produce attenuating capacity for trace constituents. The attenuating capacity would further offset the risk of surface water quality impacts, in the unlikely event that groundwater were impacted, provided that PAG is managed to minimize oxidation.

4.6 SOCIAL VALUES AND ECONOMIC CONDITIONS

The below section is a summary of anticipated impacts on social and economic issues from project activities. Additional details are found in the socioeconomic impacts report prepared by Blankenship Consulting LLC and Sammons/Dutton LLC (BCLLC/SDLLC 2014).

As discussed in **Section 3.10**, Social Values and Economic Conditions, the study area identified for potential social and economic effects is Pershing and Humboldt Counties and the communities of Lovelock, Imlay, and Winnemucca. Although two federally recognized Native American tribes—the Lovelock Paiute Tribe and the Winnemucca Indian Colony—have an established presence in the study area, their location relative to the CRI mine indicates that socioeconomic effects on the two tribes would likely be limited to opportunities for tribal member employment. Some CRI employees live in other northern Nevada communities, and CRI purchases goods and services in a number of locations in Nevada; these effects are also briefly discussed, but impacts on these locations are likely to be minimal overall.

4.6.1 Analysis Method

The potential socioeconomic effects were assessed based on the following:

- Estimates for direct employment information for construction and operations were provided by CRI (CRI 2014b in BCLLC/SDLLC 2014). A low and high scenario for the project time frame were developed in order to better estimate employment numbers. The low scenario assumes five additional years of mining and crushing, followed by three years of leaching. The high scenario assumes

seven years of mining and crushing, followed by five years of leaching, closure, and reclamation.

- The IMPLAN economic model was used to estimate the indirect and induced economic effects of the proposed construction program and continued operations.
- Construction workforce estimates were contrasted with the inventory of local motels and RV parks.
- Fiscal effects were assessed qualitatively based on CRI's estimated future production and spending.
- Social effects were assessed by reviewing the effects of previous CRI mine cessation and restarts and were based on discussions with local government officials and staff.
- SCC estimates were developed based on guidance from the Interagency Working Group (IWG) on Social Cost of Carbon in the Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (IWG 2013).

The No Action Alternative assumes that the proposed action would not be approved. Under No Action, CRI would cease active mining in 2017. After a two- to three-year period of residual leaching, the CRI mine would enter final reclamation, which is anticipated to require an additional two years.

4.6.2 Impact Indicators

The following indicators are used to measure impacts on social and economic values:

- Employment (direct construction and operations employment levels and indirect and induced employment)
- Labor income (direct, indirect, and induced income from mine construction and operations)
- Population (projected change in population levels)
- Housing availability (projected changes in temporary or traditional housing availability)
- Public facilities and services (level of demand for local services)
- Public education (enrollment level in local elementary schools)
- Fiscal effects (tax collection levels and distributions)
- Social setting (changes to social values)

4.6.3 Nature and Type of Effects

Direct Effects

Income and Employment
Construction of mine facilities results in temporary employment in the construction sector. Project operations result in direct employment by mine operators as well as long-term contractor jobs. These jobs represent short- and long-term labor income for area residents.

Population and Housing
Employment of area residents may impact both short- and long-term area population and housing availability. Population change and demand for short-term housing during construction is impacted primarily by the average number of workers required and the location of residences for these workers. Depending on their area of current residence, workers may relocate to the area for the length of the construction period or on a weekly basis or may commute daily from their places of residence.

When relocation is required, temporary construction workers typically seek short-term rental accommodations, motels, RV parks, and apartments. Project operations may require long-term immigration of employees. Operations employment is more likely to result in changes in local property values and housing availability for conventional housing (e.g., houses, apartments, and mobile homes).

Fiscal Impacts
Taxes collected from project operations contribute money to local and state economies. Mining operations in Nevada are subject to real and personal property taxes, sales and use taxes, and net proceeds of tax levies. Sales, use, and net proceeds taxes are collected by the state and are distributed to counties, school districts, and, in the case of sales and use taxes, to municipalities.

Property taxes are collected by the counties and are distributed to the county, school districts, and special districts. The mine's taxable values in these property tax categories are taxed at the same rates as other real property in the county, such as residential, commercial, and agricultural properties. Purchases of equipment, supplies, and construction materials, along with consumer purchases by the mines' workforce and other workers whose jobs are supported by the mine, are subject to sales and use taxes resulting in funds for local governments. In addition, the population supported by project operations can influence revenue from local sales and property taxes.

Public Facilities and Services, Including Public Schools
Changes in area population may impact the ability of local public facilities and schools to meet area demands for the local population. There can be impacts on

such services as utilities, health care, including emergency services, fire and public safety officers, and public schools. The level of impacts is determined by the anticipated change in population.

Social Impacts
Construction workforces are sometimes associated with increases in a variety of social issues, such as housing shortages, crowding in public and commercial facilities, substance abuse, traffic incidents, and minor disturbances. The degree to which such social changes are likely to occur depends on the size of population increase.

Indirect Effects
In addition to the direct employment and income, local economic contributions are the indirect and induced effects stimulated by a particular development, such as a mine. Indirect effects refer to the secondary impacts on area businesses that supply goods and services, for example, to CRI and its on-site contractors; induced effects refer to the secondary impacts related to consumer spending for such commodities as housing, transportation, utilities, food, clothing, entertainment, and taxes. These create revenue for such businesses as retailers, restaurants, grocery stores, gasoline stations, and movie theaters and for local and state government. This recirculation is commonly referred to as the multiplier effect.

The location of indirect effects of an economic activity depend on the location of that activity's vendors. The impact of each successive round of spending diminishes because of leaks from the spending stream to areas outside the region. Indirect and induced effects can include additional income, employment, and population changes.

4.6.4 Alternatives Analysis

Proposed Action
The proposed action would result in additional temporary construction and continued operation of the mine for an estimated five to seven years. Impacts described under the No Action Alternative from mine closure would also occur under the proposed action, but they would be at a delayed time frame due to the extended mine operation time frame.

Income and Employment
In 2013, CRI employed 290 CRI employees and 56 contractor employees. Contractors engaged by CRI make associated purchases for lodging, food, and sundry items while they are living in the area. Many employees from outside the area may purchase gasoline, food, and a limited range of sundry items locally. Project activities supported an additional estimated 352 indirect and induced jobs (see **Table 4-10**).

Table 4-10
Employment

Employment	Direct Jobs	Indirect and Induced Jobs in Nevada	Total Direct, Indirect, and Induced Jobs
Current and proposed action permanent employment			
2013 CRI direct employment	290	352	698
2013 On-site contractors	56		
Proposed action temporary construction employment	79	59	138

Source: CRI 2014b, IMPLAN

Combined payroll for 2013 operations was estimated at $24.8 million. Mining employees are among the highest paid in the local economy, and CRI accounts for a substantial share of regional household income, particularly in Pershing County. Including indirect and induced jobs, CRI supported $17.8 million in associated labor income in Nevada (see **Table 4-11**).

Table 4-11
Labor Income

	Direct Labor Income ($ Million)	Indirect and Induced Income in Nevada ($ Million)	Total Direct, Indirect, and Induced ($ Million)
2013 Operations	$24.8	$17.8	$42.6
Proposed action (construction and closures)	$18		
Proposed action (maximum over life of mine)	$189	$143	$350*
No Action Alternative (over life of mine)	$98		

Source: CRI 2014b in BCLLC/SDLLC 2014, IMPLAN
*Includes proposed action construction and closures, direct operations, and indirect and induced operations over the life of the mine, at the high scenario.

Construction

The proposed action would support an estimated 138 temporary jobs during a one-year construction period (see **Table 4-10**). The total includes an average of 79 direct construction workers employed by contractors performing work at the mine site. Some of the construction workers and contractors may come from the area (i.e., Pershing and Humboldt Counties); however, most are likely to come from more distant locations and either commute to the area daily or relocate to the area temporarily on a weekly basis.

Indirect and induced effects associated with CRI's operations are business revenues and jobs supported at mine service firms and at retail and other consumer-oriented businesses that serve the mine-related population. Materials, equipment, and services would be purchased both locally and elsewhere in Nevada. This is particularly the case in the Reno/Sparks area, where many major mining service and construction firms are located. A temporary increase in spending is anticipated in association with construction activity; an estimated

additional 59 indirect and induced jobs would be supported in the region by CRI and employee purchases.

Operations

No additional operations employees are anticipated beyond current levels under the proposed action, though it would result in an additional five to seven years of sustained direct mine and contractor employment. In addition, residual leaching, closure, and reclamation would provide employment for approximately 10 percent of the operations workforce for three to five years, with leaching expected to conclude in 2028. CRI has developed two scenarios for operations under the proposed action:

- A low scenario, assuming five additional years of mining and crushing, followed by three years of leaching
- A high scenario, assuming seven years of mining and crushing, followed by five years of leaching, closure, and reclamation

When jobs required for project operations under the proposed action are added and expressed in terms of equivalent job-years (one job for one year), between 1,850 and 2,618 direct job years would be required. In addition, between 1,866 and 2,640 indirect and induced job years would be required under the proposed action.

In total, the proposed action would generate an estimated $350 million in additional labor income over the extended mine life under the high scenario (see **Table 4-11**). This includes $18 million associated with construction and closure and approximately $189 million in payroll for operations and contractor employees at the mine.

An estimated $143 million in wages and salaries would accrue to employees of vendors and service companies supplying the mines, to state and local government agencies, and to consumer retail and service firms supported by the mine's operations and employee spending.

Population and Housing

As discussed in **Section 3.10**, Social Values and Economic Conditions, approximately 62 percent of CRI workers were Pershing County residents in 2012 (see **Table 3-13**). Of those remaining, 15 percent were Humboldt County residents and 20 percent were Churchill, Lyon, and Washoe County residents. The records also showed that some employees who lived elsewhere when hired had since moved to Lovelock. In addition, nearly a dozen employees who were permanent residents elsewhere stayed in Lovelock during the workweek (Springfield 2012 in BCLLC/SDLLC 2014).

Construction

Implementing the proposed action would trigger a year-long influx of temporary workers in Pershing and Humboldt Counties. The construction workforce, estimated to average 79 workers, would generate temporary in-migration to the project area, although some of the jobs would likely be filled from the local workforce. Of those workers who relocate temporarily, most would be unaccompanied by households, and many would relocate to the area during the workweek only, returning to their residences on weekends.

Little in-migration is expected in conjunction with the indirect and induced employment temporarily supported by construction. Unemployment rates in Pershing and Humboldt Counties in April 2014 were reported at 7.8 percent and 5.7 percent, representing nearly 800 unemployed individuals. Any new jobs would likely be filled primarily from the local labor force.

The communities around the project site—Lovelock, Imlay, and Winnemucca—have 29 motels, with a total of 1,188 rooms, and eight RV parks, with a total of 238 spaces (see **Table 3-23**). These temporary accommodations would be adequate to accommodate the temporary construction workforce. CRI would prohibit RV parking and camping at the mine site and would direct its contractors to prohibit construction workers from parking and camping illegally on BLM-administered or private lands. The temporary construction-related demand would represent a favorable impact for the local lodging industry, boosting demand during the off-season. During peak tourism and travel periods, the construction-related demand could compete with tourism/traveler-related demand on I-80; however, given the relatively small size of the construction workforce, competition is anticipated to be minimal.

Operations

Because the extended period of mining and crushing authorized by POA 10 would be accomplished with existing CRI and contractor employees, no change in local or regional CRI operations-related population or housing demand would occur; no new demand for houses, apartments, and mobile homes is anticipated. Continued employment of the CRI and contractor workforce for up to seven years would postpone the population emigration and social disruption likely to occur in the wake of workforce reductions when mining and crushing are completed.

Public Facilities and Services, Including Public Schools

CRI's direct workforce currently accounts for an estimated 105 to 135 students enrolled in Pershing or Humboldt County schools. The county school districts would experience enrollment declines in conjunction with the cessation of mining and later with completion of final reclamation and closure.

Construction

The limited scale and duration associated with the relatively small construction workforce would not require expansion of community infrastructure or additional staffing by local governmental agencies or school districts. Most

construction workers are likely to commute daily or weekly and would not be accompanied by households.

Operations

Mining and crushing during the extended period under the proposed action would be done by existing CRI and contractor employees; consequently, no new CRI operations-related demand on public services and facilities is anticipated, nor are operations-related increases in public school enrollment anticipated. Cessation of mining at CRI in the 2023 to 2025 time frame and the population emigration that would likely follow would decrease demand and use of public water and wastewater systems, law enforcement, fire suppression, emergency medical facilities, and hospitals, primarily in Lovelock and Pershing County. As a result, some staffing cutbacks and changes in public services could occur.

Similarly, declines in students are anticipated when mine operations stop. The total number and grade distribution of departing students is unknown; it would depend on household demographics in place at the time, the extent to which households affected by layoffs find other employment in the area and remain, and the extent to which they relocate from the community. Based on current residency patterns, Pershing County School District would likely lose more students than would Humboldt County School District. School district administrations would find it necessary to reduce staff and expenditures in response to the declines in student enrollment.

Fiscal Effects

In 2013, total taxes collected due to CRI project activities were $3.78 million. Sales and use taxes were CRI's single largest category of tax payments, totaling more than $2.47 million (see **Table 4-12**). Taxes were distributed to local counties, cities, and state government. Estimated distribution of sales and use tax revenue based on state and local tax rates and distribution formulas is $869,900 to Pershing County and the City of Lovelock combined, $904,700 to the Pershing County School District, and $695,900 to the State of Nevada.

Table 4-12
Taxes 2013

CRI Taxes Collected 2013 ($ Million)	
Sales and use	$ 2.5
Property	$ 0.5
Net proceeds	$ 0.7
Totals	**$ 3.7**

Source: CRI 2014b in BCLLC/SDLLC 2014

Projections of future revenues associated with the proposed action are unavailable due to multiple uncertainties about the cost and value of production. However, CRI anticipates that project operations under the proposed action would sustain the revenue contributions for up to seven years beyond those that would accrue under the presently approved mine plan.

Sales and use taxes—Although projections of future sales and use tax revenues are not available, the proposed action would generate substantial sales and use taxes. They would be from the construction of the leach pad, ongoing operations and maintenance of more than $50 million annually during mining and crushing; and residual leaching, closure, and reclamation. These revenues would provide critical financial support for the affected entities, particularly Pershing County and Lovelock.

Net proceeds taxes—Projected net proceeds taxes under the proposed action are not available, but they could be substantial, assuming that future commodity prices of silver and gold remain high. For example, the total potential value of future production under the proposed action could total $2.2 billion for the remaining life of the mine. This calculation is based on CRI's reserve estimates and assumed long-term average commodity prices of $20 per ounce for silver and $1,100 per ounce for gold. Commodity prices at those levels have produced substantial net proceeds in the past and could do so in the future, given CRI's plans to maintain labor at current levels, the scale of capital investment required, and planned other operating and maintenance spending.

Property taxes—The proposed action would maintain the capital value of plant and equipment at the mine. It would support continued annual property tax payments for up to seven years, with an additional three to five years of lower payments as leaching, reclamation, and closure occurs.

Employee-generated tax revenue—CRI-related direct, indirect, and induced employment also generates sales tax. Sources are consumer expenditures and property taxes, service charges, and local government and school district fees. CRI's workers, their families, and those households indirectly supported by the mine also contribute to the demand for public services and facilities and the need for public expenditures.

Approval of the proposed action is not, however, expected to increase the long-term residential population; demand for services is anticipated to remain at or near current levels. As a result, the fiscal support provided to local government and public services from CRI-related households likely exceeds that from most other residents and households.

Social Effects

Social effects are impacts on the social setting for local communities from direct and indirect project impacts. Impacts can be changes to social values, changes to air and water quality for local and regional community members, or changes to other nonmarket values, such as preservation of species or open space for future generations. Social effects can be analyzed in terms of qualitative changes to community values and by modeling estimates of impacts of nonmarket values in monetary terms.

The proposed project construction-related social issues are likely to be minimal. This is because of the relatively small proposed action-related construction workforce (an average of 79 workers over 12 months). It is also based on the potential for some workers to be locally hired and others to be daily and weekly commuters from other northwestern Nevada communities.

Impacts on area residents and local air and water quality would be minimized by project environmental protection measures, as detailed in **Section 2.2.10**, Environmental Protection Measures.

The social cost of carbon (SCC) is an estimate of the present value of anticipated future social and economic damages from greenhouse gas emissions. According to an Interagency Working Group (IWG) convened by the Council of Economic Advisers and the Office of Management and Budget to analyze the social cost of carbon, SCC "is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change" (IWG 2015). The IWG provided revised estimates of the SCC in 2015.

Estimating SCC is complex, reflecting a variety of models and assumptions in climate science, ecology, and economics projected decades into the future, all involving significant uncertainties. The IWG provides several estimates of SCC that are dependent on three variables: 1) the year emissions are expected to occur; 2) the discount rate (2.5, 3, and 5 percent); and 3) estimated severity of future damages. The IWG estimates consider two scenarios of damage. The Average case reflects the average costs across climate models and socioeconomic scenarios. The 95th Percentile case reflects higher than average damages that might occur, but that have a probability of future occurrence of 5 percent. This analysis of the impacts of the proposed action applies the 3 percent discount rate to the Average and 95th Percentile cases for the applicable emission years. These estimates illustrate the uncertainty about SCC due to uncertainty of the damage caused by carbon emissions but do not represent the full range of possible SCC estimates that would be based on other discount rates or cost assumptions. Of the two estimates presented, the Average scenario is more likely.

The emissions figures used to calculate the SCC for the proposed action include all projected greenhouse gas emissions expected to be emitted at the project site during the years from the onset of construction in 2016 through the closure of the mine in 2023. The nominal emissions figures used in this SCC analysis differ slightly from those used in the air quality sections. Emissions used in this SCC calculation are shown in metric tons in order to be consistent with IWG publications, while emissions in the air quality section are reported in short tons. For reference, one metric ton is equal to 0.90718474 short ton. In addition, the emissions estimates used in the SCC analysis represent the average

annual emissions rather than the maximum expected emissions reported in the air quality section.

The emissions estimates used in calculating the SCC in this study are for the expected incremental average annual emissions each year, comparing emissions under the No Action Alternative with emissions under the proposed action. Given the uncertainties in project implementation, it is possible that actual emissions may exceed these estimates in any given year. The present value of emissions dollar figures are the most recent SCC estimates provided by the IWG, adjusted for inflation to 2013 dollars. As stated by the IWG, "the SCC increases over time because future emissions are expected to produce larger incremental damages as physical and economic systems become more stressed in response to greater climatic change" (IWG 2013).

The projected emissions include CO_2 and other incidental greenhouse gases N_2O, which will be emitted by on-site internal combustion. In accordance with 40 CFR, Part 98, Subpart C, all emissions have been converted to CO_2 equivalents, which are reported in **Table 4-13**. The IWG developed its estimates of SCC specifically for the damage of CO_2. It does not estimate other greenhouse gases that have shorter lifetimes but can have more significant impacts, due to their higher global warming potential. Applying the IWG estimates of the SCC to CO_2 equivalents using global warming potential provides a lower-bound estimate of the social cost of non-CO_2 emissions (Marten and Newbold 2012). Taking this approach, the estimates in **Table 4-13** should be interpreted as a lower bound estimate of the SCC.

Table 4-13
Social Cost of Carbon Associated with Estimated Average Annual Emissions

Year Used for SCC Calculation	Present Value of Average Estimate with 3% Discount Rate (2013 $)	Present Value of 95th Percentile Estimate with 3% Discount Rate (2013 $)	Projected Average Annual Metric Tons of CO_{2e} Emissions under No Action	Projected Average Annual Metric Tons of CO_{2e} Emissions under the Proposed Action	Incremental Difference in Projected Average Annual Metric Tons of CO_{2e} Emissions under the Proposed Action Compared with No Action	Present Value of Incremental Difference in Projected Emissions Applying the Average Estimate with the 3% Discount Rate (Million $)	Present Value of Incremental Difference in Projected Emissions Applying the 95th Percentile Estimate with a 3% Discount Rate (Million $)
2015	$42	$122	31,493	34,079	2,586	$0.11	$0.32
2015	$42	$122	31,493	31,493	0	$0.00	$0.00
2020	$48	$144	0	31,493	31,493	$1.52	$4.53
2020	$48	$144	0	31,493	31,493	$1.52	$4.53
2020	$48	$144	0	31,493	31,493	$1.52	$4.53
2020	$48	$144	0	31,493	31,493	$1.52	$4.53
2020	$48	$144	0	31,493	31,493	$1.52	$4.53
2025	$53	$161	0	31,493	31,493	$1.66	$5.06
	Estimated Totals:		**62,986**	**254,530**	**191,544**	**$9.38**	**$28.02**

No Action

In general, implementing the No Action Alternative would hasten mine closure by as much as seven years. During the remaining life of the mine under the No Action Alternative, CRI estimates approximately 152,000 additional ounces of gold and 17.8 million ounces of silver would be produced. The corresponding production estimates for the proposed action are 790,000 ounces of gold and 68.0 million ounces of silver. Without the authorization of the proposed action, the expansion and construction described under the proposed action would not occur, nor would the economic effects associated with the extended period of operations. Rather, CRI would cease active mining in 2017 and, after a two- to three-year period of residual leaching, would enter final reclamation, which is anticipated to require an additional two years.

Income and Employment

The economic stimulus associated with the existing CRI operation would continue at current levels through 2016 under the No Action Alternative. Active mining would cease in 2017, and the operation would transition to residual leaching and reclamation. Approximately 90 percent of the current direct employment at the mine would be reduced after mining stops, a net reduction of approximately 310 employees. A comparable number of indirect and induced jobs would be affected in Pershing and Humboldt Counties and elsewhere in northern Nevada. The adverse effects of these job losses would be most heavily felt in Pershing County.

Labor income of the mine's employees and many of the jobs supported by purchases by mine workers would experience a corresponding reduction. This would include contracted services, as well as the consumer expenditures of employees. Total CRI-related labor income under the No Action Alternative during the remaining life of the mine is estimated at $98 million, a $252 million reduction over total labor income as compared to the proposed action. Most of that income, as well as the future reductions, would accrue to resident households in Pershing County.

Local businesses would collectively experience declines in sales revenues. The relative magnitude of the declines would drive the reductions in indirect and induced employment. Some business owners may find it necessary to decrease or cease operations. Commercial real estate vacancies would likely increase, and some real estate values would likely decline. The decreases would likely be long term, absent other mining or industrial development. Some displaced workers may choose to retire, while others may transfer to other Coeur Mining Incorporated operations.

Many or most displaced CRI workers and contractors would seek other employment, temporarily pushing local unemployment upward. Over the long term, some emigration would occur, and some workers may exit the labor

force. The net result under the No Action Alternative would be an economic contraction of the Pershing County economy.

Similar economic contraction would be associated with the proposed action, but it would occur as much as seven years later than under the No Action Alternative.

Population and Housing

Unless another major mining or other industrial project were to begin operations in roughly the same time frame, Lovelock and Pershing County would likely experience a substantial loss of population in 2018 due to reduction in CRI employment. Many direct CRI and contractor employees would likely relocate to seek employment or, given an option, would accept transfers to other Coeur Mining Incorporated operations.

Using 2013 employee residency patterns, 180 CRI direct workers live in Pershing County. Assuming an average household size of 2.51 (the average household size in Pershing County from the 2010 census), an estimated 452 people, or about seven percent of the 2013 Pershing County population, is associated with CRI direct employment. However, of the estimated 180 CRI workers who lived in Pershing County, an estimated 175 lived in Lovelock, based on the 2013 workforce distribution. Again using the Pershing County average household size, CRI workers and families represent an estimated 439 persons, or about 22 percent of Lovelock's 2013 population.

These estimates do not include the 56 CRI contract workers because the residency of contract employees is unknown. If CRI contract workers living in Lovelock and Pershing County were to emigrate after employment, population losses in Lovelock and Humboldt County would increase.

It is not known how many of the employees who would lose employment in 2018 under the No Action Alternative would relocate, but emigration of CRI employees and their families would likely represent a substantial population loss for Lovelock. Between 2007 and 2011, when CRI ceased mining and reduced the CRI workforce by about 80 percent, Lovelock's population declined by about 12 percent. The national recession also occurred during that period, so it is difficult to estimate the population loss associated with CRI employment reductions and any loss associated with the recession.

Winnemucca is a larger community, and fewer CRI employees live there. Consequently, the CRI direct employment and households represent just over one percent of Winnemucca's 2012 population base. Population loss in Winnemucca and Humboldt County would be less certain, given the larger population base, fewer resident CRI employees, and increased likelihood for alternative employment.

Absent another project starting in roughly the same period, some of the indirect and induced employees supported by CRI and employee spending may relocate to seek employment. This would contribute to further population loss, particularly in Lovelock and Pershing County. The effects on population emigration under the proposed action are similar to those that would occur under the No Action Alternative but would occur five to seven years later.

Population loss in Pershing County, particularly in Lovelock, would likely result in an adverse impact on the housing market. As CRI employees and perhaps some indirect and induced employees relocate, the number of houses available for sale would increase, potentially depressing residential real estate values. Rental properties would also likely see a reduction in demand, depressing the rental market. Again, this phenomenon would be most severe in the Lovelock area, given the relatively large percentage of CRI workers living in that community, relative to its size.

Public Facilities and Services, Including Schools

Cessation of mining at CRI in 2017 and the likely population emigration would decrease the demand and use of public water and wastewater systems, law enforcement, fire suppression, emergency medical facilities, and hospitals, primarily in Lovelock and Pershing County. Cessation of mining and the likely resulting population loss would reduce user fee revenues. Coupled with the reduction in CRI tax payments that accrue to local governments, reductions in revenues for local service providers would correspondingly result in diminished budgets, reduced staffs, and potentially decreased service levels for some public facilities and services.

Again, these effects would occur primarily in Lovelock and Pershing County, five to seven years sooner under the No Action Alternative than under the proposed action. CRI employees and their families use Pershing General Hospital in Lovelock for a variety of health care needs. CRI employees also rely on the hospital for physicals and occupational health care. Consequently, the hospital would experience reduced patient care revenues up to seven years sooner under the No Action Alternative than under the proposed action.

Pershing and Humboldt County schools would likely see enrollment declines in conjunction with the cessation of mining and eventual closure and completion of final reclamation. This would occur five to seven years earlier under the No Action Alternative than under the proposed action. The total number and grade distribution of departing students is unknown; this would depend on household demographics in place at the time, the extent to which householders affected by layoffs find other employment in the area and remain, and the extent to which they relocate. Based on current residency patterns, the Pershing County School District would likely lose more students than would the Humboldt County School District. School district administrations would likely find it necessary to reduce staff and expenditures in response to the declines in student enrollment.

Fiscal Effects

The cessation of mining and production at CRI would have fiscal repercussions for Pershing and Humboldt Counties, Lovelock, local school districts, and the state. Production cessation would lessen state and local sales and use tax, ad valorem and net proceeds taxes, and other license and fee revenues paid by CRI, its employees, and workers whose jobs are indirectly supported by CRI. The fiscal effects under the No Action Alternative would occur as active mining ceases in 2017. The level of company spending for operating and maintenance would continue to decline due to reduced production levels and staff, resulting in declining ad valorem taxes and other revenues in 2018 and beyond.

Projections of future CRI tax revenues under the No Action Alternative are not available. However, the scale of the differences is reflected in the cumulative gross value of production, which is estimated at $525 million under the No Action Alternative and $2.2 billion under the proposed action. Pershing County would be directly affected as a result of lower tax collections, and Pershing County School District would be impacted by declining enrollments on the state-authorized level of spending. Declining demand and use may allow expenditures to decline, but the levels of service may also decline.

Social Effects

Implementing the No Action Alternative would likely result in substantial social and economic disruption from the reductions in employment at CRI and the relocation of workers and families from Lovelock and Humboldt County. These effects would also accompany the proposed action but would occur five to seven years sooner under the No Action Alternative.

To help achieve economic and community sustainability post-closure of the Rochester mine, CRI has provided support to the Pershing County Economic Diversification Authority. This agency focuses on business retention and expansion, community collaboration, and business recruitment and economic development training. It also supports the Lovelock Depot Visitor Center/Pershing County Chamber of Commerce, which promotes tourism and business development throughout the county. CRI has provided monetary contributions and funded technical assistance for these organizations, and CRI employees serve in leadership capacities on these organizations' boards of directors.

Alternative 1—Permanent Management of PAG Material Outside of the Rochester Pit

Impacts from Alternative 1 on social and environmental values are the same as described for the proposed action.

4.7 SOILS

4.7.1 Analysis Method

Potential effects on soil resources were categorized as direct or indirect and as short term or long term (following mining and reclamation). Direct effects on soil resources are temporary or permanent removal of soil through grading, excavation, or building construction. Indirect effects are the degradation of soil from compaction, loss of soil productivity, disturbance from off-road activities, increased soil erosion above natural rates, and the introduction of noxious weeds.

Operating plans (**Section 2.2.9**) and environmental protection measures (**Section 2.2.10**) are incorporated into the proposed action, which would lessen the impact that the proposed project would have on soil resources. These measures would be implemented during construction and operation to reduce environmental impacts and to ensure consistency with applicable federal, state, and county rules and regulations.

The extent of impacts on the soil resources would additionally be influenced by the success of interim and final reclamation. Reclamation success, in part, depends on the amount of surface area disturbed, the quality of salvaged topsoil, stockpile redistribution methods in disturbed areas, precipitation, soil type, soil amendments, and moisture availability.

4.7.2 Impact Indicators

Indicators of impacts on soil resources and eventual reclamation potential are as follows:

- Soil characteristics at the location of site disturbances
- Accelerated erosion in excess of soil loss tolerances on waste rock and heap leach facilities or other sloping surfaces
- Loss of growth media during stockpiling or reclamation, which would limit revegetation success
- Presence of invasive plant species on disturbed acres
- Decrease in the overall site productivity from pre-mining to post-mining land uses

4.7.3 Nature and Type of Effects

Direct impacts are construction, operation, and maintenance activities that displace or mix soil horizons, that compact, remove, or contaminate soils, or that remove vegetation. The intensity and extent of impacts on soil resources are determined by the type and location of the surface-disturbing activities and interim and long-term reclamation activities. Direct impacts on soil resources can be mitigated by applicable stipulations, BMPs, and plans of operation; examples are those that address site-specific environmental concerns and

require mitigation to stabilize soil, prevent unnecessary erosion, and revegetate disturbed surfaces.

Indirect impacts are increased soil erosion potential for areas of disturbance in the project area. The construction of sloped facilities, such as the RDSs, stockpiles, and open pits, would increase the erosion hazard of soils until the completion of stabilization and revegetation during reclamation. The construction of additional features and expansion of existing features would also increase the erosion potential of soils in the project area. Specifically, these features are the yards and processing facilities, the haul, secondary, and exploration roads, and the power line corridors, sediment control structures, and water supply and ancillary facilities.

Final reclamation under the proposed action would include stabilizing and revegetating all disturbed areas in the project area.

As stated in **Section 2.2.10**, environmental protection measures pertaining to soil resources are as follows:

- Locating stockpiled growth media in areas where mining operations would not disturb them
- Constructing and seeding the stockpiles to minimize the potential for wind and water erosion
- Using BMPs strategically to reduce erosion and sedimentation
- Minimizing nonnative and invasive species weed infestations or population spread in the project area, in accordance with the weed management plan

4.7.4 Alternatives Analysis

Proposed Action

Direct and Indirect Impacts

Direct impacts on soil resources in the project area would result from the additional surface disturbance of 231 acres under the proposed action (see **Table 2-2**). Many of the proposed facilities and expanded existing facilities would become permanent features in the project area on completion of the construction phase. If these facilities were on soils classified as high risk for accelerated erosion from wind or water or as areas with biological soil crusts, then additional mitigation measures would need to be implemented to prevent undue degradation or loss of soil resources. The proposed action includes interim reclamation activities; interim reclamation areas are represented as negative numbers in the summary of existing authorized soils disturbance acres (see **Table 1-2**).

Reclamation would include replacing growth media over the stabilized surfaces of these features before revegetation. Growth media would be salvaged and stockpiled during stripping, grading, and surface clearing associated with the construction of project facilities; the media would be located away from mining activities in order to reduce erosion potential. Additionally, the growth media stockpiles would be shaped during construction and seeded to minimize erosion rates. Stockpiling growth media would reduce its overall loss, lessening the long-term impacts on soil resources.

The goals for eventual reclamation and closure under the proposed action are detailed in **Section 2.2.12**, Reclamation, and the reclamation plan in the plan of operations. In general, reclamation would involve removing mine facilities, ripping compacted soil, grading to natural landscape percentages, and establishing native vegetation to conditions that match or are better than the conditions of the original landscape. Reclamation would be ongoing during the life of the project, and areas would be reclaimed in accordance with BLM and NDEP regulations. CRI would report annually to the BLM the location and extent of reclamation that occurred in the reporting year. If reclamation is successful, then impacts on soil resources would be largely temporary and would be considered negligible at final closure of the mine.

No Action

Direct and Indirect Impacts

Under the No Action Alternative, mining and reclamation would continue based on current authorizations in the previously approved plans of operation and reclamation and closure plans. Mining would continue, using existing standard operating procedures, operating plans, and previously committed environmental protection measures; up to 1,939 acres in the plan boundary would be disturbed. The additional 231 acres would not be disturbed as under the proposed action, but indirect and direct impacts on soil resources from previously authorized mining activities would continue. Reclamation and closure would continue, based on existing and approved authorizations. At least two years before site closure, CRI would submit a final permanent closure plan, in accordance with the requirements of NDEP and the BLM.

Alternative 1—Permanent Management of PAG Material Outside of the Rochester Pit

Impacts on soil resources from implementing Alternative 1 are the same as those described under the proposed action.

4.8 SPECIAL STATUS SPECIES

No threatened or endangered species occur in the project area (JBR 2013). Additional BLM Sensitive special status wildlife species occur or have potential to occur in the project area as described in **Chapter 3**. No special status plant

species occur in the project area (JBR 2013, Tiehm 2014, Bertrando and Tiehm 2014).

4.8.1 Analysis Method

Potential effects on special status species are described as direct or indirect, short-term (i.e., during the life of the project) and long-term. Direct impacts are those that would injure or result in mortality an animal or eliminate a special status plant population or destroy habitat for the plant or animal. Indirect impacts are those that degrade habitat to the extent that population numbers decline. Short-term impacts are those that could occur during the project and until reclamation is complete; long-term impacts are those occurring after reclamation.

4.8.2 Impact Indicators

Impact indicators are as follows:

- Risk of mortality to special status species
- Acres of habitat for special status species removed temporarily and over the long term
- Injured species, normal breeding, feeding, or sheltering behavior upset, or nests abandoned due to a substantial interference with normal breeding, feeding, or sheltering behavior
- Directly impacted special status plant individual or population
- A unique or rare natural plant community eliminated, reduced, or adversely affected

4.8.3 Nature and Type of Effects

Direct Effects

Direct impacts on special status species are direct loss of nests from crushing, injury or mortality from construction or mining equipment, loss of burrow or roost habitat from ground disturbance, or harm from noise or light in the vicinity of habitat.

Mining activities, road and pad construction, and drilling equipment operation could disturb wildlife year-round, through the presence of humans, the removal of vegetation and upper soil layers, and by generating noise and dust.

Special status wildlife could also be disturbed by increased noise adjacent to habitat areas associated with the proposed action. For example, noise could impact the foraging ability of bats, which use ultrasonic signals above the spectrum of human noise. However, some bats that locate prey based on auditory cues avoid noisy areas (Francis and Barber 2013). Rodents that use chirps to warn of predators may be susceptible to increased predation because

these chirps may be masked by noise (Barber et al. 2010). Noise may cause species to avoid the area as a potential migration corridor.

Indirect Effects

Potential indirect impacts on special status wildlife are loss of nesting, brooding, roosting, foraging, and cover habitats until successful reclamation is complete, increased risk of predation from tall structures, reduced foraging or breeding success, and reduction in quantity or quality of available water.

4.8.4 Alternatives Analysis

Proposed Action

Direct and Indirect Impacts

The proposed action would directly affect special status species habitat by removing vegetation in areas proposed for surface disturbance, and by increasing human and equipment presence in habitat areas or close to active nest or burrow sites. These impacts would remove available denning, nesting, and foraging habitat. Direct impacts also include loss of the American Canyon Spring and the associated potential loss or decrease in water discharge and loss of habitat, as discussed in the Migratory Bird section (**Section 4.4.4**). The additional direct and indirect impacts from the risk of drowning, the risk of increased disease transmission, and habitat fragmentation as described in the wildlife section (**Section 4.10.4**) would also apply to special status species.

The loss of habitat would be temporary in most locations because surface disturbed by the proposed action would be reclaimed, with the exception of the main access road to the mine facilities, the public access roads, contingency ponds, and closure e-cells. Surface disturbance subject to revegetation would be seeded with a BLM-approved seed mix. The mix would contain native seeds or plants that are compatible with native soils in the project area and forb and shrub species to provide forage for wildlife.

There is potential for increased risk of predation from the existing power transmission line being relocated in the project area to a new area. Although a power transmission line is already in place, the special status species in the area where the power transmission line would be relocated risk increased predation from raptors using the power poles as perch sites. The special status species within the area that would have the power transmission line removed may experience decreased risk of predation from the removal of raptor perch sites.

There is also a potential for injury or mortality of wildlife to increase from the increased vehicular traffic associated with the proposed action. Due to the expansive amount of available habitat in adjacent areas, no impacts on regional populations are likely to result from the proposed action.

To minimize potential impacts on special status wildlife, CRI would adhere to the following environmental protection measures. Environmental protection measures are fully described in **Chapter 2**:

- If potential Preble's shrew habitat is disturbed, an equal amount of potential shrew habitat would be surveyed for three seasons (spring, summer, and fall) using a BLM-approved Preble's shrew survey protocol. In addition, disturbed potential shrew habitat would be reclaimed with a recommended seed mix that would support the shrew's habitat.
- To avoid exposing special status species nesting and brood-rearing areas during the nesting and brood-rearing season, noxious and invasive weeds would not be treated with pesticides within 0.5 mile of these areas. Wherever possible, hand spraying of herbicides is preferred over other methods to prevent impacts on wildlife, including special status species.
- In order to avoid potential impacts on burrowing owls, a qualified biologist would conduct a burrowing owl survey before ground disturbance. The survey would be of areas identified as potential burrowing owl habitat in the project area; survey results and a report would be submitted to the BLM. The nearest known burrowing owl nest site is 0.5 mile from the project area.
- Standard raptor protection designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), would be incorporated into the design and construction of power lines, and migratory bird nest protections would apply under the MBTA, as discussed in the migratory birds section (**Section 4.4**).
- Conditions in CRI's NDOW industrial artificial pond permit would apply, including covering and fencing contingency ponds to preclude access by wildlife, including birds and bats.
- Speed limits would apply on all roads in the project area to reduce potential wildlife collision impacts.

Sensitive Bird Species

BLM sensitive bird species identified in **Table 3-41**, Special Status Species with Potential to Occur in the Project Area, have potential to occur or have been observed within the project area. Potential impacts on special status bird species include those described in **Section 4.4.3** for migratory birds.

Environmental protection measures for sensitive bird species include a migratory bird measure for pre-disturbance nesting bird surveys during the nesting season (March 1 through August 31) that would also apply to sensitive bird species. Standard raptor protection designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), would be

incorporated into the design and construction of power lines. Additionally, to avoid exposing special status species nesting and brood-rearing areas during the nesting and brood-rearing season, noxious and invasive weeds would not be treated with pesticides within 0.5 mile of these areas.

Golden Eagles and Other Raptors—No raptor nests, including golden eagle nests, were located within areas subject to ground disturbance within the project area. The nearest known active golden eagle nest is 1.5 miles from the project area. Environmental protection measures for sensitive bird species, described above, would also reduce potential impacts on raptor species. Increased human and equipment presence and noise associated with the proposed action could result in raptors avoiding otherwise suitable nesting or foraging habitat in the project area.

Greater Sage-Grouse—No greater sage-grouse sign or individuals have been observed in the project area. One inactive lek is in the Indian Creek region, approximately 4.3 miles north of the project area. Existing ambient noise characterization at the inactive lek site and modeling of potential noise levels associated with the proposed action indicate that noise levels would be approximately equal to the existing ambient noise levels at the inactive lek site (JC Brennan & Associates 2014). Therefore, no additional potential impacts from noise are anticipated, and no additional noise reduction measures are included in the proposed action.

The proposed action would disturb up to approximately 20 acres of GHMA and 234.5 acres of OHMA for greater sage-grouse; this is 6 percent of the approximately 360 acres of GHMA and 10 percent of the approximately 2,300 acres of OHMA in the project area. Although no greater sage-grouse have been observed in the project area, the loss of habitat would remove potential expansion area for this species. Because the area would be reclaimed, the loss of habitat would be temporary. Approximately 16 acres of NDOW low value/transitional range sagebrush shrubland habitat would not be reclaimed following mine closure, as these areas would be impacted by contingency ponds, closure e-cells, or portions of the pit walls (see **Figure 2-9**). This represents a permanent impact of less than one percent of greater sage-grouse NDOW low value/transitional range.

Additional potential indirect impacts on greater sage-grouse as a result of the proposed action are disruption of behavior or avoidance of habitat due to human presence, increased raptor or scavenger predation from elevated equipment, interruption of "bird foot traffic" created by aboveground pipes, berms, or other linear features that may block passage, and collision with fences or other structures. These impacts would be minimal because there are no active leks near the project area.

CRI would minimize impacts on greater sage-grouse by adhering to other environmental protection measures. In accordance with the Strategic Plan for

Conservation of Greater Sage-Grouse in Nevada (Greater Sage-Grouse Advisory Committee 2012), CRI would minimize impacts by limiting disturbance areas, performing breeding bird surveys before ground disturbance, fencing artificial ponds, covering evaporation contingency ponds, reclaiming disturbed areas after use, and working with agencies to make long-term habitat improvements through reclamation. The September 2015 RMP Amendment and ROD necessitates the use of required design features (RDFs). The applicable RDFs from Appendix C of the RMP Amendment and ROD are included in **Section 6.1.1**. Additional actions to mitigate loss of GHMA through off-site habitat restoration projects are described in **Section 6.1.1**.

Burrowing Owl—Potential habitat for burrowing owl was identified in the southwestern portion of the project area, but no active or inactive burrows, owls, or sign of owl were detected during the surveys. The nearest known burrowing owl nest site is approximately 0.5 mile west of the project area. Surface disturbance could result in impacts on western burrowing owls by reducing available nesting or foraging habitat. It could also cause owls to avoid foraging in otherwise suitable habitat due to increased human or equipment presence or noise. Increased human presence and noise associated with the proposed action could cause owls to abandon their burrows.

Increased scavenger or raptor perching opportunities may also increase the risk of predation on burrowing owls or their young. Environmental protection measures would be implemented to reduce potential impacts on burrowing owl. During nesting season (March to late August) burrowing owl clearance surveys would be conducted prior to surface disturbance in areas identified as potential habitat.

Sensitive Mammal Species

Sensitive Bat Species—One sensitive bat species has been confirmed within the project area. The proposed action would not result in the disturbance or removal of bat hibernacula or roosting sites. Approximately 371 acres[3] of potential bat foraging habitat would be disturbed, representing 14 percent of foraging habitat in the project area. Removing vegetation on these lands would result in a loss of foraging habitat for sensitive bat species.

This acreage would not all be disturbed at one time due to incremental mining and interim reclamation. Reclaimed land would have more grass and forb forage and less mature shrub forage in the short term, which may result in a shift of bat species use within these areas. As the plant communities within reclaimed areas mature, larger shrubs may provide additional foraging opportunities.

[3]Impacts include both acres of vegetation that could be impacted by the proposed action in addition to acres of vegetation in areas authorized for disturbance. Total impacts excluding acres of disturbed or recently mined or quarried areas are 371 acres.

Approximately 24 acres of sagebrush shrubland and juniper savannah habitat would not be reclaimed following mine closure, as these areas would be impacted by contingency ponds, closure e-cells, or portions of the pit walls (see **Figure 2-9**). This represents a permanent impact of less than one percent of sensitive bat foraging habitat.

Bats that day roost in juniper trees or rock outcrops may lose roost sites due to project construction. Though no specific roost trees are known in the project area, dead and live trees with potential roost sites (e.g., snags, under exfoliating bark, hollow limbs, lightning scars) are present in the project area and would be removed. Removing a roost tree could cause bat mortality if it were unable to leave the roost. Evicted bats would be expected to relocate to another roost. The availability of additional roost trees in the project area is unknown, though they are likely present in the wider project area vicinity.

Bats could roost in cracks and crevices in pit walls. Lights would be used in the pit for night operations, which could attract aerial insects and thereby attract foraging bats. Due to the continuous mining disturbance, any significant bat roosting, such as hibernation and maternity use, is not expected at the pit. However, bats might temporarily roost on the walls at night between bouts of foraging.

Special status bats could be impacted by project construction or operation noise. For example, noise could impact bats' foraging ability because they use ultrasonic signals above the spectrum of human noise. However, some bats that locate prey by auditory cues avoid noisy areas (Francis and Barber 2013). Noise or human presence may also cause bats to abandon day roosting sites.

There is also a potential for injury or mortality of bats due to increased vehicular traffic associated with the proposed action. However, because most bats emerge from day roosts and begin to forage after dusk, the potential interaction between bats and vehicles is low because construction would occur during the day.

There is the potential for bats to be poisoned from ingesting process solution in industrial ponds, which can attract bats in the arid Great Basin (Clark and Hothem 1991) for drinking and foraging (O'Shea et al. 2000). However, potential sources of open water are fenced, covered, or otherwise restricted from wildlife access, as described in **Section 2.2.10**, Environmental Protection Measures.

One adit, part of the Plainview Group Mines in the Limerick Basin, was found to support one species of special status bat, the small-footed dark-nosed bat (JBR 2013). The 2015 Winnemucca District Office RMP contains guidance for protecting special status bat habitat, including inventorying for bats when disturbance is proposed within 200 yards of potential habitat, such as adits or caves, and implementing mitigation measures to reduce adverse impacts.

However, this adit is approximately 290 yards from the proposed Limerick Canyon Borrow. This indicates that potential indirect impacts from the proposed action are unlikely, due to the distance from occupied habitat.

Environmental protection measures in **Section 2.2.10** require that bat surveys be conducted if the ground near caves or adits would be disturbed or occupied and that additional avoidance measures will be developed if there is a potential to impact bats. Additionally, CRI would minimize impacts on sensitive bats by adhering to other environmental protection measures, specifically limiting disturbance areas, covering evaporation contingency ponds, reclaiming disturbed areas after use, and working with agencies to make long-term habitat improvements through reclamation.

Preble's Shrew—Up to approximately 81 acres of modeled high potential Preble's shrew priority habitat in the vicinity of American Canyon Spring would be removed by the proposed action, representing approximately 11 percent of modeled high potential habitat in the project area. Impacts from human presence and noise, risk of mortality, habitat loss and fragmentation, and increased risk of disease may apply to Preble's shrew. These potential impacts are discussed in **Section 4.10.4**.

As described in **Chapter 2**, to further knowledge of Preble's shrew, an environmental protection measure has been incorporated into the proposed action. It calls for a survey for Preble's shrew and to reclaim disturbed habitat using a seed mix that may support Preble's shrew. The purpose of the environmental protection measure is to determine if Preble's shrews are within the POA 10 boundary. It also would determine if the newly created NDOW/BLM survey protocol for Preble's shrew is effective in determining its presence.

A BLM wildlife biologist would determine the location of the surveys, in accordance with the NDOW/BLM survey protocol, prior to the surveys. Generally, the surveys would be located in modeled high potential habitat. If the survey personnel note the presence of Preble's shrew, then an equal number of acres of suitable habitat would be seeded with an appropriate seed mix to offset the loss of habitat acres.

In order to help determine an appropriate seed mix for restoring potential Preble's shrew habitat, shrew surveys should record vegetation data as species abundance, diversity, density, structure, and cover. Success criteria for Preble's shrew habitat restoration would be consistent with criteria in the Reclamation Plan (see **Table 2-5**).

Proposed mitigation activities for greater sage-grouse are included as part of the Proposed Action, as described in **Section 6.1.1**. Spring restoration included as part of greater sage-grouse restoration would also likely benefit small mammal species, including Preble's shrew. Springs identified for mitigation are in the

Black Rock Desert-High Rock Canyon Emigrant Trails National Conservation Area (NCA) and Pine Forest Wilderness. This would provide for long-term conservation of Preble's shrew habitat as the federal land in the NCA and designated wilderness areas, subject to valid existing rights, are withdrawn from location, entry, and patent under the 1872 General Mining Law. Therefore, these areas provide further protection for special status species, because multiple use activities, such as mining, would be restricted.

Sensitive Plant Species

No sensitive plant populations were documented within the project area. Disturbance would reduce the potential for special status plant species to inhabit these areas; however, there is similar habitat within and adjacent to the project area.

Residual impacts on special status species would include the loss of vegetative productivity and associated habitat from access roads, pit walls, contingency ponds, and closure e-cell areas that would not be revegetated. Habitat that would be disturbed and revegetated would have more grass and forb forage and less mature shrub forage initially, which may result in a shift of species composition within these areas.

No Action

Direct and Indirect Impacts

Under the No Action Alternative, the life of the mine would not be extended. Mining would continue on up to 1,939 acres of authorized disturbance in the existing authorized mine plan boundary, using existing standard operating procedures, operating plans, and previously committed environmental protection measures. Reclamation and closure would continue, based on existing approved authorizations. Construction and operation under the No Action Alternative would continue to directly affect special status species habitat through noise disturbance, traffic, and vegetation removal in areas proposed for surface disturbance. Most of the disturbed surface under the No Action Alternative would be reclaimed, with the exception of the open pits and the main access road to the mine facilities and the public access roads.

Alternative 1—Permanent Management of PAG Material Outside of the Rochester Pit

Alternative 1 would store PAG material permanently on the West and North RDSs and reclaim it in place. The proposed storage location would be on disturbed land that does not provide special status plant or wildlife habitat. The nature and type of effects caused by Alternative 1 are similar to those described for the proposed action.

4.9 VEGETATION

This section discusses impacts on vegetation from the proposed action and alternatives.

4.9.1 Analysis Method

The region of influence is the plan boundary and the immediate vicinity to capture all direct and indirect effects.

Impacts are assessed in terms of their duration (temporary or permanent) and context (local, regional, or national). A temporary impact is one that occurs only during implementation of the alternative, while a permanent impact could occur for an extended period afterwards. The impact could last several years or more.

As discussed in **Chapter 2**, operating plans and environmental protection measures are incorporated into the proposed action. These plans and measures lessen the impact that the proposed project would have on the human and natural environment. These measures would be implemented during construction and operation to reduce environmental impacts and to ensure consistency with applicable federal, state, and county rules and regulations. These measures are considered part of the applicant's proposed project in the environmental impact analysis presented in this EIS.

4.9.2 Impact Indicators

Potential impacts on vegetation would occur if the proposed action were to result in the following:

- Affect a plant species, habitat, or natural community recognized for ecological, scientific, recreational, or commercial importance
- Affect a species, habitat, or natural community that is specifically recognized as biologically significant in local, state, or federal policies, statutes, or regulations
- Destroy or extensively alter habitats or vegetation communities in such a way that would render them unfavorable to native species
- Fail to achieve a stable vegetation cover that protects against soil erosion or otherwise fails to meet standards
- Establish or increase noxious or nonnative invasive weed populations

4.9.3 Nature and Type of Effects

Direct effects on vegetation are temporary and permanent vegetation removal associated with construction, operation, and maintenance of the project. Indirect effects could include changes in the watershed function and condition or habitat values resulting from the changes to vegetation. Residual, or long-term impacts, are those occurring after reclamation.

4.9.4 Alternatives Analysis

Proposed Action

Direct and Indirect Impacts

Implementing the proposed action would result in direct and indirect impacts on 371 acres[4] of vegetation over the estimated five- to seven-year mine life. This does not include impacts on disturbed or recently mined or quarried areas. Recent and proposed disturbance to vegetation communities in the project area are shown in **Table 4-14**. These communities have the potential to be impacted by the proposed action. The communities provide habitat for special status and general wildlife, as discussed in **Sections 3.12** and **3.15**, respectively. Additionally, undisturbed habitats in the project area have the potential to support special status plant species, as discussed in **Section 3.12**.

Table 4-14
Vegetation Impacts—Recent (Approved) and Proposed Disturbance

Vegetation Communities	Total Acres in Project Area	Approved and Proposed Disturbance Area (Acres)
A013 Cold perennial springs and spring brooks	<1	<1
D01 Disturbed	20	7
D02 Recently burned	320	0
D03 Recently mined or quarried	1,810	187
D09 Invasive annual and biennial forb land	30	<1
S009 Intermountain basins cliff and canyon	6	0
S054 Intermountain basins big sagebrush shrubland	1,410	304
S065 Intermountain basins mixed salt desert scrub	20	0
S075 Intermountain basins juniper savanna	1,230	67
Total	**4,838**	**565**

Sources: JBR 2013; Bertrando and Tiehm 2014; Tiehm 2014
Impacts include both acres of vegetation that could be impacted by the proposed action in addition to acres of vegetation in areas authorized for disturbance. Total impacts excluding acres of disturbed or recently mined or quarried areas are 371 acres.

Vegetation in the project area would be affected by activities associated with the construction of open pits, ore and waste and growth media stockpiles, and access and haul roads. Most of the project area would be reclaimed at the end of the project, and not all surface disturbance would occur at the same time. As

[4] Impacts include both acres of vegetation that could be impacted by the proposed action in addition to acres of vegetation in areas authorized for disturbance. Total impacts excluding acres of disturbed or recently mined or quarried areas are 371 acres.

areas are mined out, they would be recontoured and seeded during interim reclamation.

Reclamation and revegetation would minimize direct impacts on vegetation communities in the project area. Revegetation would be conducted as outlined in **Section 2.2.12**, Reclamation. Because reclamation would be ongoing, CRI would report annually to the BLM the location and extent of reclamation that occurred in the reporting year. Where appropriate, disturbed areas would be recontoured, treated with reserved growth medium (see Growth Medium Management Environmental Protection Measure in **Section 2.2.10**), and seeded with an approved seed mix. Noxious weeds would be monitored and controlled under an annually updated weed management plan, as described in **Section 2.2.9** (also see **Section 2.2.10**, Noxious Weed and Nonnative Species Environmental Protection Measures).

Loss of Wetland Vegetation in American Canyon Spring

The proposed action would result in the direct impact and permanent loss of approximately 0.1 acre of wetland vegetation associated with American Canyon Spring. Though this wetland vegetation does not constitute a jurisdictional Waters of the United States (JBR 2011; USACE 2012), the spring and associated spring brook support vegetation that is uncommon in the project area, as springs and associated wetland vegetation are limited to less than 0.001 percent of the surface in the project area in three individual springs. This water source and associated vegetation support potential habitat for general wildlife and special status wildlife, including Preble's shrew, as described in **Section 3.12**.

Fugitive Dust Deposition on Vegetation

Project mining and vehicular traffic would directly and indirectly affect vegetation by increasing the amount of dust deposited onto adjacent vegetation. This could lower primary production in plants due to reduced photosynthesis and decreased water use efficiency. The potential effects on vegetation from dust would be reduced by wind and periodic precipitation, which would remove accumulated dust. In addition, the dust abatement measures outlined in the proposed action would reduce the amount of deposition on vegetation (see **Section 2.2.10**, Air Quality Environmental Protection Measure).

Temporary Modification of Vegetation Structure

During the five- to seven-year time frame, vegetation removal and subsequent reclamation could result in plant community simplification and conversion from shrub-dominated communities to grass/forb-dominated communities. Although the structure of the vegetation would be temporarily modified, the reclaimed plant community is expected to produce adequate cover to stabilize soils and provide forage for wildlife, thereby meeting reclamation goals. Seeded shrubs are expected to eventually become a codominant or dominant community component in reclaimed areas; however, this process would take several years and depends on precipitation and growth media characteristics.

Increased Potential for Noxious Weed Establishment

Ground disturbance during mining could indirectly impact vegetation by facilitating the invasion or spread of nonnative, invasive, or noxious weeds. Further, humans and vehicles accessing the site could inadvertently carry weed seeds on their clothing, shoes, tires, and the undercarriages of vehicles. Invasive weeds could outcompete native species for water, nutrients, light, and space. This could change the structure and ecological function of vegetation communities in the project area. In order to reduce the potential for weed establishment and invasion, weeds would be monitored and controlled by implementing an annually updated weed management plan, as described in **Section 2.2.9** (also see **Section 2.2.10**, Noxious Weeds and Nonnative Species Environmental Protection Measures).

Increased Potential for Wildfire

The proposed action could indirectly impact vegetation in the project area through increased potential for wildfire. Wildfires can ignite from unauthorized vehicle ingress into vegetated areas, arcing electrical equipment or transmission lines, or unauthorized littering (i.e., discarding lit cigarette butts in vegetated areas or areas where they may blow into vegetation). Wildfire can be particularly damaging in sagebrush communities, especially if annual weedy grasses are present in the understory. Cheatgrass is a significant understory component of many of the vegetation communities in the project area; if started, a wildfire may burn over larger areas and may replace sagebrush or other shrubs with an annual forb-dominated community.

The proposed action includes several measures to reduce the potential for wildfire caused by human activities in the project area. Environmental protection measures for fire protection (see **Section 2.2.10**) include several fire prevention and risk-reduction measures. Additionally, an emergency response plan (Appendix H of POA10 and **Section 2.2.9**) outlines emergency response procedures for fire.

Residual impacts on vegetation are the permanent loss of vegetative productivity from access roads, pit walls, contingency ponds, and closure e-cells that would not be revegetated. These areas represent less than one percent of vegetated habitat in the project area. Habitat that would be disturbed and revegetated would have more grass and forb forage and less mature shrub forage initially. As the revegetated plant communities mature, vegetation composition would shift from grasses and forbs to larger shrubs.

No Action

Direct and Indirect Impacts

Under the No Action Alternative, mining to access precious metals reserves and reclamation would continue, based on current authorizations. Mining would continue using existing standard operating procedures, operating plans, and

previously committed environmental protection measures. Vegetation in the project area would continue to be directly and indirectly impacted by mining.

Implementing the No Action Alternative would result in direct and indirect impacts on vegetation. The authorized disturbance of up to 1,939 acres in the existing authorized mine plan boundary (see **Figure 1-2**) could still occur.

Reclamation and closure would also continue, based on existing approved authorizations.

Fugitive Dust Deposition on Vegetation

Indirect impacts on vegetation from fugitive dust are the same as those described for the proposed action. Standard operating procedures, operating plans, and previously committed environmental protection measures would remain in place.

Temporary Modification of Vegetation Structure

Impacts on vegetation from a temporary modification of vegetation structure until shrubs reestablish during reclamation are similar to those described for the proposed action.

Increased Potential for Noxious Weed Establishment

Currently authorized soil disturbance from mining would still occur under the No Action Alternative. Therefore, indirect impacts on vegetation from noxious weed establishment are similar to those for the proposed action. Standard operating procedures, operating plans, and previously committed environmental protection measures would remain in place.

Increased Potential for Wildfire

Currently authorized vehicle activity and other mining operations would still occur under the No Action Alternative; therefore, indirect impacts on vegetation from human-caused wildfire are similar to those of the proposed action. Standard operating procedures, operating plans, and previously committed environmental protection measures would remain in place.

American Canyon Spring and Other Springs

Under the No Action Alternative, the American Canyon Spring and associated wetland vegetation would remain in place. No additional impacts on springs are expected under the No Action Alternative.

Long-term impacts on vegetation are the permanent loss of vegetative productivity from pit walls that would not be reclaimed and a long-term change in vegetation composition (such as tree- and shrub-dominated communities to grass- and forb-dominated communities) as a result of project development and operation.

Alternative 1—Permanent Management of PAG Material Outside of the Rochester Pit

Impacts on vegetation from Alternative 1 are the same as those described for the proposed action.

4.10 WILDLIFE

Wildlife observed in the project area include several bat species, lizards and snakes, deer, and small mammals. There is no fish habitat. Birds are discussed in the migratory bird section (**Section 4.4**); special status birds and wildlife are discussed in the special status species section (**Section 4.8**).

4.10.1 Analysis Method

Potential effects on wildlife resources are described as direct or indirect during the life of the project and as long term after the project ceases. Direct impacts are those that would injure or result in mortality of an animal, such as a vehicular collision, entrapment, or crushing with equipment, or that would cause a loss of habitat. Indirect impacts are the degradation of wildlife habitat such that population numbers decline, which may include the loss of habitat through vegetation removal, introduction of invasive species, reduction in prey base, or loss of a water source. Long-term impacts are those that occur after reclamation is complete.

4.10.2 Impact Indicators

Potential impacts on wildlife would occur if the proposed action were to result in the following:

- Remove or substantially disturb acres of habitat for wildlife
- Injure or result in mortality of wildlife species
- Cause species to avoid habitat due to human disturbance, including noise

4.10.3 Nature and Type of Effects

Direct Effects

Direct impacts on wildlife are injury or mortality from construction or mining equipment, loss of burrow or roost habitat from ground disturbance, or harm from noise or light in the vicinity of habitat.

Construction and operation of the project would directly affect wildlife habitat by removing vegetation in areas proposed for surface disturbance. These impacts would remove available nesting and foraging habitat for wildlife. Biological surveys have shown mammals and migratory birds nesting or denning in the project area, including great horned owl and red-tailed hawk, and others in the vicinity of the project area.

The loss of habitat is temporary in most locations because surface disturbed by the proposed action would be reclaimed and revegetated, with the exception of the main access road to the mine facilities, public access roads, the pit walls, contingency ponds, and closure e-cells. Surface disturbance subject to revegetation would be seeded with a BLM-approved seed mix. The mix would contain native seeds or plants that are compatible with native soils in the project area and forb and shrub species to provide forage for wildlife.

Mining activities, road and pad construction, and drilling equipment operation could disturb wildlife year-round, through the presence of humans, the removal of vegetation and upper soil layers, and dust production over the life of the project.

Wildlife would also be disturbed by project operation noise. Rodents that use chirps to warn of predators may be susceptible to increased predation because these chirps may be masked by noise (Barber et al. 2010). Noise may cause deer to avoid the area as a migration corridor.

There is potential for increased risk of predation from the existing power transmission line being relocated in the project area to a new area. Although it is an existing power transmission line, wildlife in the area where the power transmission line would be relocated has risk of increased predation from raptors using the power poles as perch sites. Wildlife within the area that would have the power transmission line removed may experience decreased risk of predation from the removal of perch sites.

There is also a potential for injury or mortality of wildlife to increase from the increased vehicular traffic associated with the proposed action. Due to the available habitat in adjacent areas, no impacts on regional populations are likely to result from the proposed action.

There is the potential for injury or mortality of wildlife from ingesting process solution in industrial ponds, which can attract wildlife in the arid Great Basin (Clark and Hothem 1991) for drinking and foraging (O'Shea et al. 2000). However, potential sources of open water are fenced, covered, or otherwise restricted from wildlife access, as described in **Section 2.2.10**, Environmental Protection Measures.

Indirect Effects

Potential indirect impacts on wildlife are the loss of nesting, brooding, roosting, and foraging and cover habitats, increased predation from predators perched on tall structures, reduced foraging or breeding success from human disturbance, habitat avoidance resulting from human disturbance, and reduction in quantity or quality of available water.

Under long-term reclamation, grasses, shrubs, and forbs would become reestablished in the project area's wildlife habitat. The proposed action would

result in a net loss of potential habitat but would not contribute to a loss of viability for wildlife, including game species.

4.10.4 Alternatives Analysis

Proposed Action

Direct and Indirect Impacts
Under the proposed action, mining would continue for an additional five to seven years. Mining would disturb up to 371 additional acres[5] of vegetated habitats (not including impacts on disturbed or recently mined or quarried areas) in the expanded mine plan boundary. Reclamation and closure would occur, based on annual authorizations.

Impacts on vegetation, which is analogous to impacts on wildlife habitat, are provided in the vegetation section. However, habitat loss from indirect impacts on habitat, including noise and light disturbance, increased human presence, and increased habitat fragmentation, may encompass a larger area for some species.

Wildlife would be able to return to the disturbed areas upon completion of ground disturbance and reclamation. However, individuals that return to the site after reclamation could be affected by the fragmentation and disturbance associated with the project. This could reduce breeding success and increase the susceptibility to predators or disease. This in turn could affect the distribution of large mammals and raptors that forage on rodents and small mammals.

In the project area, fencing would exclude wildlife from using much of the lands where habitat has been removed, obstructing the movement of deer and other large mammals.

As discussed in **Section 4.4.4**, migratory birds, under the proposed action, American Canyon Spring would be directly impacted by construction of a new Stage V HLP. American Canyon Spring provides a potential water source for wildlife in the project area, including for migratory birds, special status species, and general wildlife. Water discharged into American Canyon would still represent a potential water source for wildlife, particularly those larger species that may easily move longer distances in search of water. However, for smaller species unable to travel longer distances, this relocation of available water would reduce the available potential water source. Two additional springs in the project area would not be disturbed by the proposed action.

[5] Impacts include both acres of vegetation that could be impacted by the proposed action in addition to acres of vegetation in areas authorized for disturbance. Total impacts excluding acres of disturbed or recently mined or quarried areas are 371 acres.

Areas of open standing water would increase the risk of insect disease spread by providing habitat for disease vectors such as mosquitos, by being toxic to wildlife if it were to contain toxic process solution, and by increasing the potential for terrestrial wildlife to drown. Process ponds, which are a potential source of open water, are fenced or otherwise restricted from wildlife access, as described in **Section 2.2.10**, Environmental Protection Measures. Though no open pit lake is proposed after closure of the Rochester pit, exceptionally heavy rainfall may induce temporary ponding in the pit, making it attractive to wildlife.

Transmission lines would provide perches for predatory birds, such as raptors and corvids. Perches correlate with an increased predation on prey species, such as smaller birds and small mammals. Avian protection measures would be incorporated into transmission line design to protect birds and bats.

As discussed in **Chapter 2**, environmental protection measures would be implemented to minimize potential impacts on wildlife species. These measures include fencing around contingency ponds to block wildlife access and covering contingency ponds that could be lethal to birds or bats. In addition, CRI would minimize areas of disturbance, reclaim disturbed areas after use, and work with agencies to make long-term habitat improvements during reclamation.

Residual impacts on wildlife include permanent loss of habitat resulting from the proposed action. As discussed in **Section 4.9**, Vegetation, less than one percent of vegetated habitats in the project area would be permanently impacted and not revegetated. Because the amount of habitat acreage lost as a result of the proposed action is small relative to undisturbed and revegetated habitats in the project area, and because expansive habitat occurs directly adjacent to the project area in the region, population viability for any one species is not expected to be reduced as a result of the proposed action.

No Action

Direct and Indirect Impacts

Under the No Action Alternative, mining would not be extended by five to seven years; however, it would continue, based on current authorizations. Mining would continue to allow up to 1,939 acres of authorized disturbance in the existing authorized mine plan boundary, using existing standard operating procedures, operating plans, and previously committed environmental protection measures.

Construction and operation under the No Action Alternative would continue to directly affect wildlife habitat through noise disturbance, traffic, and vegetation removal in areas proposed for surface disturbance. Most of the surface disturbance under the No Action Alternative would be reclaimed, with the exception of the open pits and the main access road to the mine facilities and

the public access roads. In addition, setback areas between the barriers and pit edges would not be revegetated.

Alternative 1—Permanent Management of PAG Material Outside of the Rochester Pit

Under Alternative 1, PAG material would be stored permanently in the North and West RDSs. The proposed storage location would be on disturbed land that does not provide wildlife habitat. The nature and type of disturbance caused by Alternative 1 would be similar to what was described for the proposed action.

This page intentionally left blank.